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EFFECT OF NAVY INDIVIDUAL AUGMENTEE
DEPLOYMENT/S ON MENTAL HEALTH OUTCOMES

by

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March 2008

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13. ABSTRACT (maximum 200 words)

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Analyses on the officer and enlisted models indicate that an IA deployment by itself does not appear to adversely affect mental and physiological health outcomes. However, an IA officer deployed to a hostile location substantially increases the probability of requiring a mental health referral compared to a non-IA officer who is also deployed to a hostile region. In contrast, an enlisted service member on an IA tour to a hostile location has a lower probability of an adverse mental and physiological health outcome compared to a non-IA enlisted service member who is also assigned to a hostile region. Due to the long period of manifestation of mental health problems, future study should follow up with those soldiers one year after the deployment.

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EFFECT OF NAVY INDIVIDUAL AUGMENTEE DEPLOYMENT/S ON MENTAL HEALTH OUTCOMES

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ABSTRACT

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I. INTRODUCTION

A. BACKGROUND

The United States has decreased its military force despite the increase in military commitments around the globe. The one-third cut in active-duty manpower at the end of the Cold War, from 2.1 million to 1.4 million in uniform, has resulted in the need for longer and repeated deployments, especially for the Army and Marine Corps. These deployments have posed challenges for active-duty service members and for their families (Hosek, Kavanagh & Miller, 2006).

Since the September 11, 2001, terrorist attacks, the United States military forces have been tasked to thwart the threats posed by various terrorist organizations around the world. The increase in operational demands on the Global War on Terrorism (GWOT) has put a strain on military manpower. With the Pentagon's call on the Navy to provide forces to ease the strain on Army and Marine Corps ground units, Navy individual augmentees are flocking to South Carolina to learn the basics of ground combat (Jontz, 2006). An individual augmentee is a sailor who leaves their assigned unit or command to deploy individually or with a small group. At an all-hands call at Camp McCrady, South Carolina, on January 19, 2007, former Chief of Naval Operations Admiral Mike Mullen stated,

> I see Individual Augmentee duty as a long-term commitment by the Navy. I'm anxious to pitch in as much as we possibly can, for the duration of this war. Not only can we do our share, but [we can] take as much stress off those who are deploying back-to-back, home one year, deployed one year and now are on their third or fourth deployment. (U.S. Navy, 2007)

This thesis seeks to analyze the effect of deployments on the mental health outcome of Navy individual augmentees.

B. POLICY IMPLICATIONS AND RELEVANCE

In support of the Global War on Terror (GWOT), the Navy is sending sailors (active or reserve) to support or assist the requesting command's contingency operations.

These sailors are deployed as individual augmentees (IA). IAs can be sent anywhere they are needed to support contingency operations around the world.

Hoge, Castro, Messer, McGurk, Cotting, and Koffman (2004, July) stated that previous research on other conflicts found that deployment stressors and exposure to combat increased the risk of mental health problems. Since the onset of the GWOT, the military has increasingly turned to Navy individual augmentees to support the Army and Marine Corps units. Navy sailors on IA deployments are subject to additional stresses, as they are thrust into an unfamiliar environment away from their parent command. Coupled with these stressors and being away from the member's unit, an IA on deployment does not have the support, comfort, and camaraderie he/she can usually rely on. This could be significant because, as Ahronson and Cameron (2007) noted, belonging to a group or unit enhances the effectiveness and psychological well-being of an individual. There has been minimal research on the effects of IA deployment on the mental health outcomes of Navy individual augmentees.

C.   PURPOSE OF THIS STUDY AND RESEARCH QUESTIONS

Given the importance and increasing mobilization of the Navy IAs, it is imperative that the DoD understand the implications of such assignment to a soldier's mental health. The purpose of this thesis is to analyze and identify factors affecting the mental health outcome of deployed Navy individual augmentees. In addition, the study will analyze whether the effect of IA deployment/s (if any) is moderated by other service characteristics such as military occupational specialties and location of deployments. The primary focus is the effect of different aspects of deployment/s (location of deployment) on mental health outcomes.

The research question of this thesis is to determine the effect of Navy individual augmentee (IA) deployment/s on the service member's mental health outcomes.

D.   OVERVIEW OF THE STUDY

The data for this paper come from three different sources: Navy individual augmentee data from Navy Personnel Command Active Duty Augmentation (PERS-4G3)

branch, pre- and post-deployment health assessment questionnaire forms (DD Form 2795 and DD Form 2796 respectively) from the Army Medical Surveillance Activity (AMSA), and demographic data from Defense Manpower Data Center (DMDC). A multivariate analysis using STATA software is used to analyze the effect of deployments on Navy individual augmentees. The analysis employs the use of the probit and ordinary least squares models.

E.   ORGANIZATION

The rest of the thesis proceeds as follows.   Chapter II provides background information of the Navy IA program. Chapter III provides a review of existing literature on the mental health of military personnel related to the thesis. Chapter IV describes the data sources. Chapter V provides an explanation of the dependent and control variables. Chapter VI layouts the analytical method and multivariate probit regression models employed in the analyses. The dependent variable will be the mental health outcome of the Navy individual augmentee. The control variables include basic demographics, military occupation, location of deployment, and year of deployment. Chapter VII provides the descriptive statistics of the data. Chapter VIII presents the results of the multivariate analysis. Chapter IX provides a conclusion and recommendation based on the results obtained in the analysis including areas for further research.

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II.   BACKGROUND ON INDIVIDUAL AUGMENTEES

This chapter begins with the definition of a Navy individual augmentee. The subsequent sections describe the individual augmentation process, different training phases that a sailor undergoes upon notification of individual augmentation duty, and resources available for the individual augmentees and their families. The chapter concludes with a section highlighting the incentives and entitlements of an individual augmentee.

A.   WHO IS A NAVY INDIVIDUAL AUGMENTEE?

In contrast to a sailor who deploys with a ship, squadron or unit, a sailor who leaves their assigned unit or command to deploy individually or with a small group is known as an Individual Augmentee (IA) (ECRC 2007a). Individual augmentees serve to augment staff positions in support of contingency operations while other IAs provide direct support. Either Active or Reserve Component personnel can fill IA positions (CJCS, 2004, January). Most IAs are concentrated in the 26-nation Central Command region, which includes Iraq, Afghanistan, Kuwait, Bahrain, and the Horn of Africa (ECRC, 2007a).[1] The rest are serving elsewhere in the world, including the military detention at Guantanamo Bay, Cuba (ECRC, 2007a). The Navy has deployed over 46,000 sailors as individual augmentees since the beginning of the Global War on Terror (GWOT) (CNO, 2006b).

There are nearly 7,000 existing IA billets (Faram, 2008, p. 14). About 60% of the billets are filled with active duty personnel and the remaining 40% are filled by reservist (p. 14). Four years ago, 96% of the IA jobs were being filled with selected reservists (p. 14).

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[1] The Central Command's area of responsibility are Afghanistan, Bahrain, Djibouti, Egypt, Eritrea, Ethiopia, Iran, Iraq, Jordan, Kazakstan, Kenya, Kuwait, Kyrgyzstan, Lebanon, Oman, Pakistan, Qatar, Saudi Arabia, Seychelles, Somalia, Sudan, Syria, Tajikistan, Turkemistan, United Arab Emirates, and Uzbekistan.

Table 1. **Enlisted jobs with a high likelihood of an IA assignment**
(Adapted from Faram, 2008, January, 21, p. 16)

Enlisted US Navy Ratings	
Hospital Corpman	Fire Controlman
Master-at-Arms	Operations Specialist
Information Systems Technician	Personnel Specialist
Storekeeper	Cryptologic Technician
Yeoman	Aviation Warfare Systems Operator

B. INDIVIDUAL AUGMENTEE (IA) ASSIGNMENT PROCESS

The Office of the Chief of Naval Operations (OPNAV) Instruction 1001.24 provides the policies and procedures that provide guidance to the individual augmentee process. Combatant commands determine and validate billet requirements to support specific National Command Authority (NCA) mission taskings, and subsequently task service component commands to provide individuals to meet those requirements (CNO, 2000). The Director of Total Force Programming and Manpower Management Division (OPNAV N12) provides the active duty and reserve component assets. The Director of Naval Reserve (OPNAV N095) provides for reserve personnel under the Presidential Reserve Call-up (PRC). If the Navy is unable to fill the requirements, the Office of the Chief of Naval Operations will initiate the IA process. The individual augmentation process is depicted in Figure 1.

C. TRAINING PHASES FOR INDIVIDUAL AUGMENTEES

Sailors identified for individual augmentation are required to undergo several phases of training to meet the IA requirement. The first phase of their training is at their parent command; the second phase is at the Navy Mobilization Processing Site; the third phase is combat skills training at Fort Jackson, South Carolina; and the final phase is in-theater.

1.   **Training Prior to Departure**

Sailors are required to complete electronic courses listed under the "Individual Augmentee Prerequisite Training" link on the Navy Knowledge Online (NKO) website. They also have to complete the Expeditionary Combat Readiness Center (ECRC) and the Readiness and Deployment (DA Form 7475) checklists. The requirements have to be completed within fourteen days prior to departure from the parent command.

2.   **Navy Mobilization Processing Site**

Individual augmentees are processed at one of the four processing sites. The sites are located at the naval bases in Norfolk and San Diego (NAVBASE Norfolk and NAVBASE San Diego) and at the Naval Construction Battalion Centers at Gulfport and Port Hueneme (NCBC Gulfport and NCBC Port Hueneme).
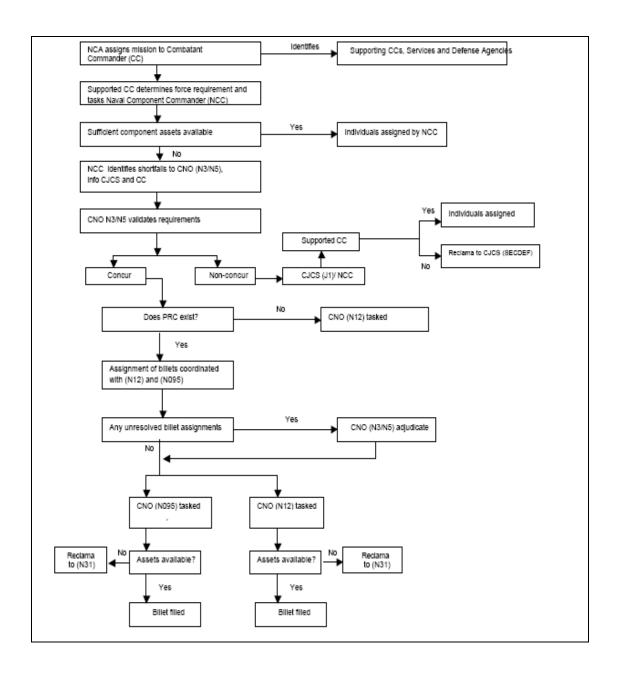
Figure 1.   The Process of Individual Augmentation Assignment (From: Office of the Chief of Naval Operations, 2000, Enclosure (2))

Note: CNO (N3/N5)-Deputy Chief of Naval Operations Informations, Plans, & Strategy; N31- Office of the Chief of Naval Operations (Information, Plans, and Security Division); CJCS (J1)- Chairman of the Joint Chiefs of Staff (Manpower and Personnel).

At processing sites, Sailors undergo approximately five days of pre-deployment processing and screening including ensuring any pre-departure training has been

completed, followed by travel to Fort Jackson or other Army unit where they receive gear and uniforms, combat skills and additional specialized training to prepare for assignment in theater (NKO, 2007a).

3. Combat Skills Training

Navy individual augmentees go through three weeks of basic combat skills training developed by the Army (NKO, 2007a). The basic combat skills training include weapons qualifications, convoy and urban operations, code of conduct, first aid, and cultural awareness (ECRC, 2007b). Most sailors are trained by Army Drill Instructors at Navy Individual Augmentee Combat Training (NIACT) located at Fort Jackson, South Carolina (NKO, 2007b, p.10). Other sailors are trained at different locations depending on the specific IA training that is required by the combatant commander.[2]

D. RESOURCES

The Navy recognizes the rigors and the demands of an individual augmentation assignment. The Service has provided a wealth of resources that the IAs and their families can utilize during the pre-deployment, deployment, and post-deployment phases of the assignment.

The Expeditionary Combat Readiness Center (ECRC) was established in 2006 to support all Navy individual augmentees and their families. The ECRC provides information on services available for the family and it is the primary point-of-contact for all theater related family issues.[3]

Services like the American Red Cross, Military Chaplain, Fleet and Family Support Centers, Navy Marine Corps Relief Society, TRICARE, and Personnel Support Detachments (PSD) provide varied services to support the needs of the individual augmentees and their families. Many commands have successfully put a process in place to ensure sailors selected for an IA assignment and their families are properly prepared

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[2] Other locations for IA training include Camp Shelby, Fort Bliss, Fort Bragg, Fort Dix, Fort Hood, Fort Huachuca, Fort Louis, Fort Riley, and Fort Sill.

[3] Expeditionary Combat Readiness Center (ECRC), under "IA Resources".

for and fully supported during and reintegrated upon completion of their IA assignment (NKO, 2007a, p. 22). Parent commands have a Command IA Coordinator who is responsible for all preparation, questions, concerns, and assistance necessary to support completion of a successful IA assignment (p. 22). Commands receiving the individual augmentee have sponsors to help the individual adjust to the new environment.

E.   INCENTIVES

A number of incentives are available to offset some of the challenges of IA duty (p. 26). These incentives are varied and are spelled out in specific Navy administrative messages (NAVADMIN). Some IA incentives include: (1) priority choice of follow on duty assignment and location after serving an IA tour of over 270 days (CNO, 2007c); (2) two award points credited toward advancement after serving an IA tour greater than ninety days (CNO, 2007c); (3) family relocation for an IA assignment greater than a 365 days (CNO, 2006b);   (4) options for taking the advancement examinations while deployed in Iraq, Afghanistan, or the Horn of Africa (CNO, 2007a); (5) awarding a Navy enlisted classification code for enlisted personnel and a special additional qualification designator for officers for IA duty (CNO, 2006a); and (5) monetary entitlements.

1.   Professional and Personal

The Navy has implemented several initiatives to recognize the efforts of sailors on IA duty. These include advancement points for enlisted sailors who have spent over 90 days in Iraq, Afghanistan, or in the Horn of Africa (CNO, 2007c), priority on follow-on orders for IA tours over 270 days (CNO, 2007c), and the option for taking the advancement exams (CNO, 2007a). Other incentives include allowing the family to relocate to a different location when the service member is going to be deployed greater than 365 days (CNO, 2006b).

Another incentive is that the Navy has created a New Enlisted Classification Code (NEC), and officers will be given a special Additional Qualification Designator (AQD) that tags them as having done IA duty (NKO, 2007b, p. 19). These new codes were created to capture critical skills sailors have earned through training and experience in

GWOT (CNO, 2006a). Receiving these specialty codes allows promotion boards to recognize the contributions of the sailors in the GWOT.

2.   Monetary Entitlements

Monetary entitlements of individual augmentees include hostile fire pay/imminent danger pay, combat zone tax exclusion, hardship duty pay, incidental expenses, and family separation allowance (NKO, 2007a, p. 26). Contributions to the Thrift Savings Plan (TSP) are tax exempt up to the maximum amount of $45,000. A guaranteed 10% annual interest rate compounded quarterly on savings deposit up to the maximum amount of $10,000. All these entitlements are guaranteed to start for eligible personnel no later than 30 days "boots on ground"[4] retroactive to the first day of eligibility (NKO, 2007a, p. 27).

F.   SUMMARY

The increases in operational demands on the Global War on Terror (GWOT) have put a strain on military manpower. In support of the GWOT, the Navy is sending sailors to support or assist the requesting command's contingency operations. These sailors who get deployed individually or with a small group are called individual augmentees (IA). Prior to reporting to the requesting command, IAs undergo seventeen days basic combat skills training like weapons qualifications, convoy and urban operations, code of conduct, first aid, and cultural awareness. Navy sailors on IA deployment are subject to additional stresses as they are thrust into an unfamiliar environment away from their parent command. Additionally, an individual augmentee away from the member's parent unit does not have the support, comfort, and camaraderie he/she can usually rely on. There has been minimal research on the effects of IA deployment on the mental health outcomes of Navy individual augmentees.

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[4] Boots on ground refers to the time the individual augmentee enters and departs the receiving command's area of responsibility.

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III. LITERATURE REVIEW

This chapter starts with the introduction of the effects of the Global War on Terror (GWOT) on the U.S. military forces. It proceeds to review the numerous existing literatures relating to deployment stressors, mental health, and group cohesion. Given the limited availability of literature on individual augmentees, the review utilizes various reports on the various services in the military. The chapter concludes with a summary of the contributions of the literature to the study.

A.   INTRODUCTION

Since 9/11, the U.S. has increasingly called operational military forces to engage in global missions, resulting in frequent deployment cycles and immense psychological tasks inherent in them (Hoyt, 2006, p. 309). Prosecuting the Global War on Terrorism (GWOT) has required campaigns of sustained operations to remote regions, each with unique physical, emotional, and mental challenges (p. 309). Approximately 1.5 million American troops have been deployed in support of the war effort; one-third of them have served at least two tours in a combat zone, 70,000 have been deployed three times, and 20,000 have been deployed at least 5 times (Johnson, Sherman, Hoffman, James, P. Johnson,& Lochman, 2007, p. 9). The strain on combat and the uncertainties surrounding deployments have a detrimental effect on the psychological well-being of the individual soldier.

Since the onset on the Global War on Terror, the military has increasingly turned to Navy individual augmentees (IA) to support contingency operations. Soldiers under IA deployment are subject to additional stress as they are thrust into an unfamiliar environment away from the parent command. Deployment stressors and being away from the member's unit are magnified for an IA on deployment because he or she does not have the social support, comfort, and camaraderie that he/she can rely on.

The tempos of deployments have increased since the start of GWOT. Supporting the global war on terrorism using individual augmentees raises the question on the effect

on the mental health outcome of the military service member. Numerous research literatures document the stresses and challenges encountered by military personnel during deployments and the effects on mental health. However, these studies dealt with military service members who were deployed as units rather than individual augmentees. There are increased stressors for the deployed individual augmentees and they do not experience the moderating effects of unit cohesion.

There have been numerous research literatures on the effects of deployments and exposure to combat on soldiers. Results of these studies have shown that deployments are associated with an increased risk of post-traumatic stress disorders (PTSD), substance abuse, suicidal ideation, and depression.

Varied sources have been used for this literature review given the limited research directly addressing the effects of deployment on the mental health outcomes of individual augmentees. This study utilizes various reports on the members of other branches of the Department of Defense that could have some bearing on this topic.

B. DEPLOYMENT STRESSORS

It is inherent in the military service that members of the armed forces could be deployed wherever they are needed at any time. Since the start of the Global War on Terror (GWOT), the number of deployments and their duration has increased. The types of deployments can vary to include humanitarian, peacekeeping and combat missions. According to Pincus, House, Christenson, and Adler (2001) and Pincus and Nam (1999), there are five phases of deployment: (1) Pre-deployment, (2) Deployment, (3) Re-deployment (military member is scheduled to return home), (4) Sustainment, and (5) Post-deployment. Pincus and his colleagues state that each phase of the deployment has unique stressors and that failure to resolve or master the stressor/s creates a significant strain on the soldier's psychological well-being. Multiple deployments can have a significant impact on the psychological being of the soldier (Pincus et al., 2001; Pincus & Nam, 1999; Halverson, Bliese, Moore, & Castro, 1995; Hosek, Kavanaugh, & Miller, 2006; Office of the Surgeon Multinational Force-Iraq and Office of the Surgeon General United States Army Medical Command, 2006).

A number of stressors are common to most deployments (Newby, McCarroll, Ursano, Shigemura, & Tucker-Harris, 2005, p. 815). Many of these were identified during World War II, including uncertainty, separation, isolation, danger, fatigue, and differences in status and privilege among ranks and services (p. 815). In the post-Cold War era, the time and location of deployment, availability of communication with family members and friends, boredom, and interruption of future plans have contributed to increased stressors in present day deployments (p. 815).

Adler, McGurk, Stetz, and Bliese (2003) argued that each deployment has a unique constellation of stressors. They cited that soldiers who were deployed in Somalia experienced stress due to lack of food and water while soldiers deployed on Operation Joint Guard in Bosnia did not. Soldiers deployed in Kosovo reported through interviews that they were stressed because of the U.S. government policy of allowing them to carry weapons. Gifford, Ursano, Stuart, and Engel (2006) reported that the main stressor identified during the early phase of the Persian Gulf War was the uncertainty of the tour length, since soldiers had no idea whether they would be there for a few more weeks or, at the other extreme, possibly a year or more (p. 586). Halverson, Bliese, Moore, and Castro (1995) cited that U.S. Army personnel deployed in Haiti experienced high levels of stress due to poor sanitation.

Newby et al. (2005) explored the soldier's perception of the consequences of a deployment. The study involved a survey of 951 Army soldiers who had been deployed to Bosnia. The soldiers were asked whether their deployment to Bosnia was a positive or negative experience. The results of the survey conducted by Newby et al. reveal deployments have positive and negative consequences. Single soldiers had a higher likelihood of experiencing positive consequences during deployments compared to married soldiers (82% vs. 72%) (p. 816). Married soldiers were more likely to report negative benefits of deployment than single soldiers (70% vs. 55%) (p. 816). Single sailors were more likely to report chain of command issues as a negative consequence of the deployment, whereas married soldiers were more likely to report that being away

from family/missing important events as the most negative consequence of deployment (p. 818). The authors posited that the perception of a deployment depended on whether the soldier was married or single.

Hosek, Kavanagh, and Miller (2006) examined how more recent deployments have affected military service members. They analyzed the effects of deployment using two methods. The first method was using focus groups to identify the different perspectives of a deployment. The focus group consisted of officers and enlisted members from the Navy, Army, Air Force, and Marine Corps units that had returned from duty in Iraq and Afghanistan. The second method was employing a linear probability model to analyze data that came from the Status of Forces Surveys of Active Duty Personnel for the period covering March 2003 (10,828 respondents) and July 2003 (10,284 respondents).

Hosek et al. (2006) confirmed the persistence of some stressors present: separation from family and friends, uncertain deployment dates, high work tempo, and austere living conditions (p. 37). Other significant sources of stressors reported by the focus groups were coping with the injury or death of colleagues, physical challenges, and exposure to danger (p. 37). Although the focus group reported negative aspects of a deployment, they also cited some positive benefits like participation in challenging missions, camaraderie, unit cohesion, and financial gain. Married service members reported more stress from family separation than single service members. The results affirmed the findings of Newby et al. in that the impact of a deployment on a military service member depends whether the soldier is married or single. Empirical findings also reveal that senior personnel are less likely to suffer from work stress than junior personnel. Hosek et al. contended that this finding can be explained by senior personnel having had more experience and additional training that would help them deal more effectively with stress (p. 84).

C.   MENTAL HEALTH

The U.S. military represents the diversity of the U.S. population with varying ethnic groups, social backgrounds, occupations, and demographic characteristics (Riddle,

T. Smith, B. Smith, Corbeil, Engel & Wells., 2007, p. 198). Military service members face inherent occupational risk factors that increase their risk of mental health problems. The mental health of military service members affects organizational productivity and effectiveness and is of great importance to the U.S. military for retention, readiness, and mission capability (p. 193). Mental health problems are some of the most common and disabling medical conditions that affect service members (Hoge, Wright, Bliese,Thomas, Castro, & Milliken, 2004). There is an increasing need in the mental health arena especially in the areas of alcohol abuse, suicide, depression, and posttraumatic stress disorder.

1. Alcohol Abuse

Alcohol abuse is a major concern in the U.S. military, since the use of alcohol is associated with a myriad of adverse outcomes that can affect both individual and collective health and performance of soldiers (Hollander, Bell, Phillips, Amoroso,& MacFarling, 2006). In a research study conducted by Bray, Hourani, Omsted, Witt, Brown, and Pemberton (2006), it was found that heavy alcohol use (consuming five or more drinks on the same occasion at least once a week in the past thirty days) among military personnel had declined from 1980 to 1998. However, there was a significant increase in average alcohol use: from 1.08 ounces per day in 2002 to 1.43 ounces per day in 2005. The Army had the largest percentage increase in heavy alcohol use from 18.8% in 2002 to 24.5% in 2005. There were no significant changes in the other branches of the military. They also noted that heavy alcohol use was predominant in service personnel who had deployed in the previous 12 months.

Riddle et al. (2007) created a baseline longitudinal study on the prevalence of mental disorders in the U.S. military. The invited participants came from a sample provided by the Defense Manpower Data Center (DMDC). The sample represented 11.3% of the 2.2 million service members (Navy, Marine Corps, Army, Coast Guard, and Air Force) who were in service as of October 1, 2000. Two standardized instruments, Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PHQ) and Post Traumatic Stress Disorder Checklist-Civilian version (PCL-C) were used to evaluate

mental health measures. The results of the study revealed that alcohol abuse (11.6% of the cohort) was the most prevalent mental disorder. The sample population in the study who had the highest propensity to abuse alcohol was male, single, less educated, enlisted, active duty, Marine, and a combat occupational specialty.

The Iowa Persian Gulf Study Group (1997) compared the self-reported symptoms and illnesses of military personnel deployed in the Persian Gulf during the war to military personnel in the same timeframe who did not get deployed in the Persian Gulf region. They randomly selected 4,886 subjects from a sample population of 28,968 persons, all of whom declared Iowa as their home of record. The results revealed that alcohol abuse was observed to be prevalent in military personnel who were deployed in the Persian Gulf. Military personnel deployed during the Persian Gulf War had a higher alcohol abuse prevalence compared to military personnel not deployed to the Persian Gulf (17.4% vs. 12.6%).

2. Suicide

Suicide has been the second or third leading cause of deaths of U.S. military personnel (Eaton, Messer, Garvey-Wilson, & Hoge, 2006; D'Mello, Williams, Eaton, & Pflanz, 2007). Between 1980 and 2003, rates of self-inflicted deaths among U.S. military members have varied between 9.0 to 15.0 per 100,000 person-years (D'Mello, et al., 2007, p. 8). A more recent military casualty information report revealed that the suicide rate of active duty service members spiked from a low 9.0 per 100,000 in 2001 to 11.7 deaths per 100,000 person-years in 2006 (Assistant Secretary of Defense, Public Affairs, 2007). Additionally, from a policy perspective, apparent spikes in suicide rates often lead to heightened concerns among the Department of Defense (DoD) leadership, and occasionally prompt intense public scrutiny (Eaton, Messer, Garvey Wilson, & Hoge, 2006, p. 183). These suicides are only the most visible manifestation of the rising mental health toll from the Iraq war and other U.S. combat operations abroad (Robinson, 2004, p. 1).

Hourani, Warrack and Coben (1999) conducted an analysis to determine if the rates of suicide in the Navy were higher than those of the civilian population. A

comparison of the Navy's 362-reported suicides from 1990 to 1995 with the civilian population revealed that the suicide rate in the Navy was less than that for the U.S. general population, after controlling for age, sex, ethnicity, and employment status. The result was attributed to the medical screenings that eliminated applicants with mental and physical impairments. Hourani et al. added that suicide prevention programs, availability of psychiatric care, camaraderie, and team membership reduced social isolation and depression.

Scoville, Gubata, Potter, White, and Pearse (2007) conducted a retrospective epidemiology study of suicides among military recruits who joined the U.S. Air Force, Marine Corps, Navy, and Army from 1981 through 2004. The researchers identified 66 self-inflicted deaths among recruits from 1980 through 2004. Their findings indicated that a higher proportion of single recruits had an increased risk for suicides. The suicide rates were 3.5 times higher for male compared to female recruits. The study supports the conclusion that suicide rates of military recruits were lower than a comparable U.S. civilian population. They contended that lower suicide rates could be attributed to mental health screening before entering military service, the controlled and closely monitored training environment, and ready access to free medical care (p. 1028). Scoville et al. supported the previous findings of the study conducted by Hourani, Warrack, and Coben.

3.   Depression

Depression is the most common mental health problem in the general population and is associated with many symptoms that could reduce the military readiness of those it affects (Bray, et al., 2006, p. 206). These symptoms include disturbed sleep; fatigue; persistent physical problems; and difficulty concentrating, remembering, and making decisions (p. 206).

Hoge, Castro, Messer, McGurk, Cotting, and Koffman (2004) conducted a study to assess the mental health of U.S. military personnel who participated in combat operations and other hazardous duties while deployed in Iraq and Afghanistan. The study group was composed of three combat infantry units from the Army and one Marine Corps unit. Anonymous surveys to assess depression, generalized anxiety, and posttraumatic

stress disorder were administered to the units before deployment and again three to four months after their return. Using logistic regression to control for differences in demographic characteristics of members in the study group, the results showed that soldiers and marines returning from Iraq and Afghanistan reported experiencing mental health problems. The survey revealed that 11.4% of the soldiers and marines were depressed prior to deployment, but that increased to 14% to 15% after their return from ground combat operations or hazardous duties.

A population-based analysis by Hoge et al. (2006) was conducted to evaluate the post deployment mental health screenings after soldiers and marines have returned from their deployments to Operations Enduring and Iraqi Freedom and other regions around the world. The sample population consisted of 303,905 Army soldiers and Marines who completed the Post Deployment Health Assessment Questionnaire (DD Form 2796) from May 1, 2003, to April 30, 2004. The DD Form 2796 assessment for depression consisted of two questions derived from a validated screening instrument used in a primary care setting that included the questions on depression ("feeling down, depressed, or hopeless") and anhedonia ("little interest or pleasure in doing things") (Hoge, Auchterlonie, & Milliken, 2006, p. 1024). A positive response to either of these questions was considered to be a risk factor for depression (p. 1024). The outcome of the study showed that soldiers and marines deployed to Operation Iraqi Freedom (OIF) experienced a higher rate of depression compared to those deployed in Operation Enduring Freedom (OEF) and other locations around the world. The percentage of soldiers who responded to one positive response on the depression stem question was 4.5% for OIF, 2.5% for OEF, and 1.9% for others. The percentages of two positive responses were 1.6% for OIF, 1.0% for OEF, and 0.8% for others. Positive screens for depression were also noted in other studies of personnel who have deployed (Hoge, Wright, Bliese, Adler, Thomas, Castro, & Milliken, 2004; Office of the Surgeon Multinational Force-Iraq and Office of the Surgeon General United States Army Medical Command, 2006).

4.   Post Traumatic Stress Disorder (PTSD)

PTSD, as defined by the Veterans Administration (VA), is a psychiatric disorder that can occur following the experience or witnessing of life-threatening events such as military combat, natural disasters, terrorist incidents, serious incidents, or violent personal assaults like rape (Murray, 2007). PTSD is associated with reported reductions in quality of life across several domains, including general health, energy, emotional well-being, emotional role limitation, physical role limitation, and social functioning (Erbes, Westermeyer, Engdahl, & Johnsen, 2007, p. 362).

Deployment and combat expose soldiers to various extreme physical, psychological, and social stressors that can have a profound impact on psychological well-being (Adler, 2004, p. 1). Hoge, Castro, et al. (2004) pointed out that exposure of personnel to deployments stressors and combat poses an increased risk of mental health problems like PTSD. Mental Health Advisory Team (MHAT) IV reported that soldiers are 3.5 times more likely to screen positive for PTSD if they experience high combat. The report also added that multiple deployers were 1.6 times more likely to screen positive for PTSD than those who were first time deployers.[5] This seems like a diminishing effect of further deployments as one would expect that those who were deployed twice would have twice the rate, if it is incident based.

Orcutt, Erickson, and Wolfe (2004) designed a study to examine the PTSD symptoms of a sample of Gulf War veterans. Their goal was to explore the assumption that PTSD had two pathways, one with PTSD symptoms increasing over time and the other was PTSD symptoms decreasing with time. The study involved three different time periods. The first time period was 5 days after the sample population returned to the United States from the Gulf War in 1991, the second time period was in 1993-94, and the third time period was in 1997-98.

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[5] Office of the Surgeon Multinational Force-Iraq and Office of the Surgeon General United States Army Medical Command, *Mental Health Advisory Team IV (MHAT IV) Operation Iraqi Freedom 05-07 Final Report,* November 17,2006, 23, http: //www.armymedicine.army.mil/news/mhat/mhat_iv/MHAT _IV_Report_17NOV06.pdf (accessed November 25, 2007).

Orcut, Erickson, and Wolfe found in their analysis two groups of PTSD symptomatology. The first group was characterized by PTSD symptoms increasing slightly over time and the second belonged to a group whose PTSD symptoms increased significantly over time. They did not find a group whose symptoms decreased. The findings of the study revealed that more exposure to combat, being a female, belonging to a minority, and having less education increased the probability of having PTSD symptoms. Military rank and age were not significant predictors of PTSD in this study.

In a study conducted Erbes et al. (2007), they evaluated the PTSD levels of the National Guard, Reserves, and personnel discharged from the active service who served in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). PTSD was assessed using the 17-item self –report questionnaire PTSD Checklist (PCL). The results from the PCL questionnaire revealed that 12% of the sample population reported having PTSD. Previous studies reported 9.8% (Hoge et al., 2006) and 9% (Grieger, Kolkow, Spira, & Morse, 2007) of personnel having symptoms of PTSD.

D.   GROUP COHESION

Military cohesion is the bonding of members of a unit or organization in such a way as to sustain their will and commitment to each other, their unit, and the mission Johns, et al., 1984, p. ix). Individual augmentees are individually assigned temporarily to different military units rather than as a part of a traditional military organization. As a result, an opportunity to build a strong interpersonal relationship, peer bond, and be a part of a cohesive unit is difficult. Inadequate social (Cobb, 1976; Griffith, 2007) and emotional support (Siebold, 1999) diminishes the psychological well-being of the individual augmentee. In the meta analysis of Oliver, Harman, Hoover, Hayes, and Pandhi (1999) on nine military cohesion studies, they concluded that group cohesion increases the ability of soldiers to cope with various military stressors. Empirical evidence from their research also reveals that the military supports cohesion and fosters its development. Griffith and Vaitkus (1999) added that cohesion helps sustain individuals and groups during periods of stress and prevents mental health breakdowns. Hosek et al. (2006) reported increased unit cohesion among deployed soldiers because of

shared experiences and trials. Fellow soldiers relied on each other for support, comfort, and survival (p. 51). Ahronson and Cameron (2007) likened a military unit to a sports team. Both groups have the ultimate goal of accomplishing the mission. Each individual member must work together to achieve the desired goal. Cohesiveness of the unit determined the accomplishment or failure of the mission.

Bozeman Hadden, Harrison, & Royal (2006) conducted a study to evaluate the health effects of deployment on active duty service personnel who were deployed in Iraq or Afghanistan between the time periods of January 2003 and January 2004. Using the weighted survey results to compare the deployed and non-deployed groups, the researchers discovered that unit cohesion and support decreased the effects of deployment stressors. The study also revealed that unit cohesion and support might have a protective effect against a PTSD outcome (p. 17). Various empirical studies suggested that stressful events leading to PTSD and other psychiatric symptoms are decreased as unit cohesion increases (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Gal & Jones, 1995).

Soldiers in combat require cohesion to persist in their mission and to prevent individual breakdown (Ingraham & Manning, 1981, p. 4). The lack of frequency of interaction, common experiences, shared values, and understanding of a unit's history predisposes the individual augmentee to a greater risk for adverse mental health outcomes.

E.   SUMMARY

Since the onset on the Global War on Terrorism, the military has increasingly turned to Navy individual augmentees to support contingency operations anywhere around the globe. Individual augmentees are temporarily assigned to other branches of the military services. Being away from the parent command, an individual augmentee does not have the support, comfort, and camaraderie that he/she can rely on from other members of the unit. Individual augmentees may find it difficult to form strong interpersonal relationships, peer bond or be a part of a cohesive unit.

Given the limited availability of research on the mental health outcome of individual augmentees, a myriad of literature pertaining to the different branches of the military was utilized to identify factors that may have an effect on the psychological well-being of a soldier. Some factors that create a significant strain on the mental health of the individual soldiers are stressors experienced during deployment like uncertainty, isolation, danger, separation from family and friends, boredom, or a lack of communication. Cogent literatures also indicate that mental problems are some of the most common and disabling medical conditions that affect service members. There is an increasing need in the mental health arena, especially in the areas of alcohol abuse, suicide, depression, and posttraumatic stress disorder.

Existing literature has shown that unit cohesion decreased the effects of deployment stressors. Unit cohesion among deployed soldiers is increased due to shared experiences and trials. They are also able to rely on each other for support and comfort. Individual augmentees play a critical role in the Global War on Terror; it is important to have current information on the factors that have an impact on their psychological well-being.

IV. DATA DESCRIPTION

This chapter provides a detailed description of the various sources of the dataset used for this study. Section A identifies the different agencies and the data files they respectively provided. This section also identifies the entity responsible for the merging of the different datasets. Section B presents the different research studies that support the validity of the deployment health questionnaire. Section C summarizes the highlights of the chapter.

A. DATA SOURCES

The data used for this thesis came from three different sources: the Active Duty Personnel Cohort file (a compilation of data elements extracted from the Active Duty Military Personnel, Active Duty Military Pay, Desert Storm, and other files), the Pre-deployment (DD Form 2795) and Post-deployment (DD Form 2796) health assessment questionnaire, and the Active Duty Navy Individual Augmentation files. The Defense Manpower Data Center (DMDC) constructed the extract of the Active Duty Personnel Cohort file, while the pre- and post-deployment health questionnaire files were provided by the Army Medical Surveillance Activity (AMSA). The Navy active-duty individual augmentation (IA) file was provided by the Active Duty Augmentation (PERS-4G3) branch of the Naval Personnel Command (NPC). The Army Medical Surveillance Activity (AMSA) merged the pre- and post-deployment health assessment data with the data obtained from Active Duty Augmentation (PERS-4G3) and Defense Manpower Data Center (DMDC) using a social security number match. The data extract was approved under Naval Postgraduate School (NPS) Institutional Review Board (IRB) expedited review.

1. Active Duty Personnel Cohort File

The active duty personnel cohort file was extracted from several sources. The cohort file was built mainly from the Active Duty Military Personnel File, Active Duty Military Pay File, and Desert Storm File. The dataset included all enlisted and officer

active-service personnel who served between the periods of October 1997 to September 2007. This study restricted the data to Navy active-duty personnel. This data provided demographics, services, and other background information of the study population. Specifically, the data elements selected for use in this study included: education, rank, enlisted occupational specialty, Navy officer billet code (NOBC), enlisted and officer paygrade, marital status, race/ethnicity, gender, and age. Descriptive statistics of these data elements are provided in Chapter VII.

2. Active Duty Navy Individual Augmentee (IA) File

The file provided data on all Navy active-duty personnel designated as individual augmentees who were deployed throughout the various theaters of operations. This dataset comprised all active-duty Navy individual augmentees between the periods of March 2002 to November 2007. This dataset is used to identify individuals who were deployed as IA, as well as those serving the duration of their IA deployment. The IA elements selected for the study consisted of dates and geographical location of deployments, PTSD stem questions, Navy officer designator codes, self-rated responses, and healthcare provider assessments. Descriptive statistics of these data elements are provided in Chapter VII, along with other background characteristics.

3. Deployment Health Questionnaire File

The Navy has always used individual sailors to "augment" or assist other commands when needed (NKO, 2007b, p. 4). However, more sailors than ever before are being deployed as individuals, instead of with a ship, squadron, or battalion (p. 4). The strain of combat, extended deployments in the war zone, emotional and physical stresses, and hostile operating environments puts sailors at high risk for mental health problems. To monitor the health effects of deployments, the Department of Defense (DoD) instituted a comprehensive deployment health program. *Department of Defense Instruction 6490.03* (2006, August 11)[6] made it mandatory for all deploying service

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[6] DoD Instruction 6490.03, *Deployment Health* (2006, August 11) has cancelled previous DoD Instruction 6490.3, *Implementation and Application of Joint Medical Surveillance for Deployments* (1997, August 7).

members from all Services to complete the Pre-deployment Health Assessment form (DD Form 2795) within sixty days prior to expected deployment. Service members completing their deployment must complete the Post-deployment Health Assessment form (DD Form 2796)[7] during in-theater medical out-processing or within thirty days after returning home. If redeploying, DD Form 2796 must be completed not earlier than thirty days of the expected redeployment date but not more than thirty days after redeployment. All completed forms are submitted to the Defense Medical Surveillance System (DMSS). The DMSS is maintained by the Army Medical Surveillance Activity (AMSA), U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM). This dataset contains critical information that is the basis for the dependent variable in the multivariate analysis model used in this study. Details of the survey instrument that is relevant to this study are provided below.

The exemptions from the requirements of completing the Pre- and Post-deployment Health Assessment questionnaire are delineated by Navy Environmental Health Center (NEHC) Technical Manual 6490.00-1-September 2000. It states that routine shipboard operations that are not anticipated to involve field operations for over thirty continuous days are exempted from Deployment Health Surveillance (DHS) (Navy Environment Health Center, 2000, September 1). If the deployment status is uncertain, military service personnel are required to complete the Pre- and Post-deployment Health Assessment questionnaire. In the event that the military unit deploys and returns within 30 days, completion of the Post-deployment Health Assessment questionnaire is not required.

a. Pre-deployment Health Assessment (DD Form 2795)

DD Form 2795 is a required form that allows military personnel to record information about their general health and shares any concerns they have prior to deployment (Post-Deployment Health, 2007a, p. 1). It is mandatory for all deploying military personnel to complete this form. Upon completion of the form, a healthcare

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[7] The current version of DD Form 2796 dated September 2007 has replaced the previous version dated April 2003. Questions on behavioral and physical health have been enhanced. A question on traumatic brain injury has been added to the current version.

provider[8] reviews the health assessment questionnaire. Any positive response to questions 2 through 8 in the health assessment section is referred to a trained health care provider.[9]

Data elements selected from this dataset include enlisted pay and officer paygrade, pre-deployment health assessment questions: 1) Would you say your health in general is excellent, very good, good, fair, or poor; and 2) During the past year, have you sought counseling or care for your mental health, and a healthcare provider (HCP) referral for mental health evaluation.

b.   *Post-deployment Health Assessment (DD Form 2796)*

The primary purpose of the DD Form 2796 is to provide Healthcare Providers (HCP) a brief screening form to evaluate the post-deployment health of returning service members (Post-Deployment Health, 2007b, p. 3). After completing DD Form 2796, a health assessment evaluation with a trained health care provider is scheduled for the returning military member. Mental health assessment is limited to questions on potentially traumatic exposures: four questions covering key domains of PTSD, two stem questions for depression, one screening question about suicidal ideation, two questions related to concerns about aggression, and one question about interest in receiving help (Hoge, et al., 2004, April). Other questions fall into the demographic, general health and occupational and environmental exposure categories.

Data elements selected from this dataset include dates of arrival and departure from the theater of operation, geographical location of deployment, self-rated responses to post-deployment health assessment questions: 1) Did your health change during this deployment? and 2) Have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month you: a) have had any nightmares about it or thought about it when you did not want to, b) tried hard not to think about it or

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[8] *DoD Instruction 6490.03* defines health care provider as a nurse, medical technician, corpsman, or medic.

[9] *DoD Instruction 6490.03* defines trained health care provider as a physician, physician assistant, advanced nurse practitioner, nurse practitioner, independent duty corpsman, independent duty medical technician, or Special Forces medical sergeant.

went out of your way to avoid situations that remind you of it, c) were constantly on guard, watchful, or easily startled, and d) felt numb or detached from others, activities, or your surroundings? Other elements included were post-deployment health care provider health assessment interview questions: 1) Would you say your health in general is excellent, very good, good fair, or poor? and 2) During this deployment have you sought, or do you now intend to seek, counseling or care for your mental health and a health care provider referral for mental health evaluation?

B.   VALIDITY OF DEPLOYMENT HEALTH QUESTIONNAIRE

Soldiers returning from combat military operations are at risk for developing a range of psychological problems (Bliese, Wright, Adler & Thomas, 2006, p. 78). One way to facilitate the identification of these at-risk soldiers is to have them complete a psychological screening survey (p. 78). The *Department of Defense Instruction 6490.03* mandates the completion of the psychological screening survey for all deploying service personnel. Psychological screening is a pro-active attempt to bring military mental health support to service members (p. 79).

Researchers have conducted studies to assess the validity of the screening instruments utilized by the military health services. Bliese, Wright, Adler, Thomas, and Hoge (2004) conducted a blind validation study of the Post-deployment Health Assessment Questionnaire (DD Form 2796) on 592 soldiers returning from the war in Iraq. They primarily focused their study on Question 12 of DD Form 2796. Question 12 is a primary screen survey to assess traumatic stress experiences.

Figure 2.   DD Form 2796 Question 12: Items Used to Screen for Symptoms of Traumatic Stress (From: Post-deployment Health Assessment (DD Form 2796), 2003, April)

The results of the study revealed that the sensitivity (0.73) and specificity (0.88) of Question 12 was adequate when the military service member positively responded to at least two items. The researchers concluded that the four items comprising Question 12 of the DD Form 2796 did a reasonable job of identifying soldiers who were independently assessed as needing referrals for traumatic stress and PTSD (Bliese et al., 2004, p. 9). Using the results of this blind validation study in another article, Bliese, Wright, Thomas, Adler, and Hoge (2004, December) reported that the four PTSD-related items on Question 12 of the DD Form 2796 did a good job of identifying symptomatic soldiers.

Hoge, Auchterlonie, and Milliken (2006, March 1) investigated the validity of the Post-deployment Health Assessment questionnaire (DD Form 2796) as a screening tool for a mass-population-level assessment of mental health problems. They conducted a population-based analysis on DD Form 2796 completed by military service members who were deployed to Operation Enduring Freedom, Operation Iraqi Freedom, and other locations around the world. The findings of their study supported the construct validity of DD Form 2796. Another finding in the study revealed a strong linear relationship of mental health problems with deployment location and combat exposure (2006, March 1,

p. 1030). The researchers also added that the Post-deployment Health Assessment questionnaire was limited in predicting the usage of mental health services of individual military service members.

C. SUMMARY

In summary, the Active Duty Personnel Cohort file constructed by DMDC, Navy Individual Augmentee file furnished by the Active Duty Augmentation (PERS-4G3) of Naval Personnel Command, and the Pre- and Post-deployment Health Assessment questionnaire (DD Form 2795 and DD Form 2796 respectively) files provided by the Army Medical Surveillance Activity (AMSA) are merged using a social security number match. The linked data contains mental health information, IA identifiers, and background characteristics that allow us to answer the research questions. The Army Medical Surveillance Activity has kindly merged all the data files and stripped all personal identifiers prior to delivery of the data extract to NPS. The studies conducted by Hoge, Auchterlonie, and Milliken (2006, March 1) and Bliese, et al. (2004) supported the validity of the deployment health questionnaire.

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V. VARIABLE DESCRIPTION

This chapter defines and discusses the dependent and control variables used to analyze the mental and physiological health outcomes of Navy individual augmentees. The demographic and service variables correspond to values at the time of deployment. Section A discusses dependent variables. Section B discusses the control variables used in analyzing the mental and physiological health outcomes. Section C provides a summary of the control and dependent variables used in this study.

A. DEPENDENT VARIABLES

1. Mental Health Outcomes

a. *Mental Health Referral*

The dependent variable, "having a mental health referral," is binary and it indicates if the U.S. Navy service member was directed by the healthcare provider to have a mental health evaluation. Mental health referrals are indicated after the healthcare provider reviews the Pre- or Post-deployment Health Assessment questionnaire. If a mental health referral is indicated, the service member received a value of 1; if not, a value of 0 is assigned.

b. *Sought or Intend to Seek Mental Health Counsel*

The dependent variable, "sought/intend to seek mental health counseling," is a binary variable, and it indicates if the service member has sought mental health counsel or intends to seek mental health counsel. The intention to seek mental health counsel is indicated in the Pre- and Post-deployment Health Assessment questionnaire. If the service member has sought or intends to seek mental health counsel, he or she receives a value of 1; if not, a value of 0 is assigned.

c. *Propensity to Develop PTSD*

The dependent variable, "PTSD," is a binary variable and it indicates if the service member has the propensity to develop PTSD. The propensity to develop PTSD is based on answers to question number 12 of the Post-deployment Health Assessment questionnaire. A value of 1 is assigned if the service member has identified having at least 2 conditions from that question; otherwise, a value of 0 is given.

2. Physiological Health Outcomes

a. *Report of General Health Getting Worse after Deployment*

The variable, "reported health got worse after deployment," is a binary variable, and it indicates if the service member reports that his or her health worsened after deployment. Service members' change in health is indicated in the Post-deployment Health Assessment questionnaire. If the service member reports that his or her health worsens then a value of 1 is assigned; otherwise, the value is 0.

b. *Healthcare Provider's Assessment of General Health as Being Fair or Poor*

The variable, "health care provider assessment of service member's general health as being fair or poor," is a binary variable and it indicates the general health assessment by a healthcare provider of the service member after deployment. The general assessment of health is indicated in the Pre- and Post-deployment Health Assessment questionnaire. If the healthcare provider indicated that the service member has a general health status of fair or poor, a value of 1 is assigned; otherwise, a value of 0 is given.

B.   CONTROL VARIABLES

1.   IA Identifier

There are two types of IA identifiers used in the analysis. An "IA sample" indicator takes on the value of 1 if the soldier has ever been deployed as an IA during the study period; 0 otherwise. An "IA tour" indicator takes on the value of 1 if the soldier responded to the post-deployment survey after his or her IA tour. In other words, by including both indicators, we can establish whether there is baseline differences in health outcomes between the IA and non-IA sample and identifies whether health outcomes got worse after an IA deployment.

2.   Environment of Deployment

The service member's deployment is divided into two groups, hostile and non-hostile, based on DD Form 2796 location information. A list of geographical areas is listed in the Post-deployment Health Assessment questionnaire for the service member to indicate place of deployment. The areas identified by the service member as place/s of deployment were then compared to the Military Pay Policy and Procedures-Active Duty and Reserve Pay (DoD 7000.14-R), Vol. 7A, Chapter 10. This DoD manual lists the designated hostile areas and effective dates of designation. The omitted category is non-hostile. The variables are binary. If the service member is deployed to one of the group a value of 1 is assigned; otherwise, a value of 0.

Rank is divided into the different groups for enlisted and officers. Each rank variable is binary. For enlisted personnel, ranks of the service member were E1-E3, E4, E5, E6, and E7, E8-E9. Officers' ranks were O1-O2, O3, O4, O5, O6, and WO (1-5). These variables were assigned a value of 1 if the service member was currently in the the rank, otherwise a 0.

3.   Occupation

Enlisted service personnel are divided into six occupational groups: Weapons, Ordnance and Electronics, Administration/Others, Engineering and Hull, Construction,

Aviation, and Medical. The omitted category in the regression is Construction. The variables are a binary. If the service member belongs to the occupational group a value of 1 is assigned; otherwise, a value of 0.

The officers were divided according to their Navy Officer Billet Code (NOBC). The Navy Officer Manpower and Personnel Classification (NAVPERS 15839I, Vol. I, Part C) was used to identify the officer's occupational experience or education. The engineering (facilities, electronics, weapons, and naval) and personnel fields had a small sample size. These fields were combined with the sciences and services field. The occupational fields were divided into five groups: Healthcare Services; Supply and Fiscal; Sciences and Services, Personnel, Facilities Engineering, Electronics Engineering, Weapons Engineering, and Naval Engineering; Aviation; and Naval Operations. The omitted category is Supply and Fiscal. The variables are a binary. If the service member belongs to the occupational group, a value of 1 is assigned; otherwise, a value of 0.

4. Race/Ethnicity

The racial and ethnic groups are divided into three classes: white, black, and others. The data dictionary provided by the Defense Manpower Data Center has additional race codings that were added in April 2006. This study did not use the new race coding. The omitted category is white. The variables are a binary. If the service member belongs to one of the classes, a value of 1 is assigned; otherwise, a value of 0.

5. Marital Status

Marital statuses for officers are divided into three groups: Single with no family, single with family, and married. The marital status of the enlisted personnel is divided into six groups: single, single with dependents, single unknown dependents, married with no dependents, married with dependents, and unknown. The omitted category for officers is married while an enlisted service member is married with no dependents. The variables are a binary. If the service member belongs to one of the groups, a value of 1 is assigned; otherwise, a value of 0.

6.   Education

Educational status for officers is divided into three groups: bachelor's degree, master's degree or higher, and other educational credentials.   Some commissioned officers are not required to have a bachelor's degree like Warrant and Limited Duty Officers. For enlisted personnel, educational status is divided into five groups: non-high school graduate, high school graduate, bachelor's degree, master's degree or higher, and other educational credentials. The omitted category for officers is bachelor's degree and high school graduate for enlisted personnel. The variables are binary. If the service member belongs to one of the groups, a value of 1 is assigned; otherwise, a value of 0.

7.   Year of Deployment

The calendar year the service member was deployed is divided into four groups: CY 2002, CY 2003, CY 2005, and CY 2005-2007. The omitted category is CY 2002. If the service member is deployed to one of the groups, a value of 1 is assigned; otherwise, a value of 0.

8.   Age

This explanatory variable is the age of the service member at the time of deployment.

C.   SUMMARY

The control variables used in the studies include the following categories: rank, occupation, race/ethnicity, marital status, education and environment of deployment. The dependent variables are divided into two categories - namely, mental health outcomes and physiological health outcomes. Mental health outcomes include mental health referral, sought or intend to seek mental health counsel, and propensity to develop PTSD. Physiological health outcomes include report of general health getting worst after deployment and health care provider's assessment of general health as being fair or poor.

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VI.   STATISTICAL MODEL

This chapter identifies the statistical model used for the study. Section A defines the analytical model. Section B describes the multivariate probit regression models.

A.   ANALYTICAL METHOD

Probit models are used in this study. Probit models are nonlinear regression models designed for binary dependent variables, which are bounded between zero and one. Unlike linear models where the predicted probabilities can either exceed one or drop below zero, the conditional probabilities of the probit model will always range between 0 and 1. In this study, the dependent variable is binary and takes on the value of 1, otherwise it takes a value of 0. The theoretical model is:

$$\Pr(Y=1 \mid X=x) = \Phi(x'\beta)$$

where:

Y = The probability that the dependent variable is 1

Φ = Cumulative standard normal distribution function

X = Vector of the regressors

β = Coefficient of the regression typically estimated by maximum likelihood

B.   MULTIVARIATE PROBIT REGRESSION MODELS

In this study, three sets of models are used to analyze the effect of deployment on Navy individual augmentees: the general model, model with interaction terms between IA identifier and hostile deployment, and a set of sensitivity analysis models. For the first two sets of models, separate regressions are run for the five dependent variables. The third model re-estimates the first two models using a matched sample between pre- and post-deployment health assessment surveys. There are three dependent variables used in the third model: "having a mental health referral," "sought/intend to seek mental health

counseling," and "healthcare provider assessment of service member's general health as being fair or poor." The models employed in the study are the same for officers and enlisted personnel.

1.   General Model for Mental and Physiological Health Outcomes

The first model focuses on the main effect of an IA tour and hostile deployment and has the following general form:

Pr(adverse mental or physiological health outcome) = β_0 + β_1(IA tour) + β_2 (indicator for ever deployed as an IA) + β_3(hostile deployment) + β_4 (explanatory variables)

We examined the same five outcomes (three mental health and two physiological health) for the officers and enlisted personnel. The description of the variables is presented in Chapter V.

The key explanatory variables for this model are two IA identifiers and an indicator for hostile deployment. Those key variables are presented in both the officer and the enlisted models. There are two IA identifiers, one identifies whether a soldier is ever deployed as an IA during the study period (henceforth IA sample), the second identifies whether the outcome is recorded after an IA tour (henceforth IA tour). The hostile deployment indicator and more details on the IA identifiers were described in Chapter V.

In this model, gender, race/ethnicity, age, year and hostile deployment variables will be defined the same way for officers and enlisted personnel. The other control variables (occupation, marital status, and education) are defined differently between the officer and enlisted personnel groups, as described in Chapter V. The enlisted service member's occupational groups include Weapons, Ordnance, and Electronics; Administration/Others; Engineering and Hull; Construction; Aviation; and Medical. The officer's occupational groups include healthcare; supply and fiscal; sciences, personnel, and engineering; aviation; and naval operations.   Marital statuses for enlisted personnel are: single, single with dependents, single unknown dependents, married with no

dependents, married with dependents, and unknown. The marital statuses for officers are single with no family, single with family, and married. Finally, the educational groups for enlisted personnel include non-high school graduate, high school graduate, bachelor's degree, master's degree or higher, and other educational credentials while the educational groups for officers include a bachelor's degree, master's degree or higher, and other educational credentials.

2. Interaction of IA Identifier with Hostile Deployment

The model adds the interaction term between the two IA identifiers and hostile deployment. The interaction term is used to determine the effect of an IA tour on mental health outcomes and depends on whether the solder was sent to a hostile deployment. This model uses the same control variables for the officer and enlisted service member general models, with the exception of the interaction variables.

3. Sensitivity Analysis Models

The main model and the interaction models were re-estimated using matched samples between Pre- and Post-deployment Health Assessment surveys. The three dependent variables used in the sensitivity analysis models are sought/intend to seek mental health counseling, health care provider assessment of service member's general health as being fair or poor, and having a mental health referral (the other two outcomes are not asked in the Pre-deployment survey). The sensitivity analysis model uses the same explanatory variables used in the previous two models for officers and enlisted personnel. We lost about 75% of the sample when matching pre- and post surveys. We ran the sensitivity analysis to test the stability of our main results.

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VII. DESCRIPTIVE STATISTICS

This chapter presents summary statistics used in providing the interpretation for the mental health outcome analyses of the Navy individual augmentee. Section A compares the descriptive statistics of officers and enlisted personnel who had never been assigned an IA tour and those who had been assigned an IA tour anytime during the study period.

A. PRELIMINARY DATA ANALYSIS

1. Characteristics of the Officer Cohort.

Table 2 provides statistical sample of two groups of officers. The first group consists of officers who were never assigned an individual augmentee tour. The second group consists of officers who were deployed as an individual augmentee at anytime between the periods of 2002–2007. The sample size was based on the respondents of the Pre- and Post-deployment Health Assessment questionnaire. The table shows the distribution of the control variables for the entire officer sample.

Table 2.   General Characteristics of Officers 2002-2007

	Officer who was never assigned to an IA tour	Officer who was an IA sometime during 2002-2007
	mean	**mean**
Rank Distribution		
Unknown rank	0.2%	0.0%[+++]
O1-O2 (ENS-LTJG)	31.4%	20.7%[+++]
O3 (LT)	33.5%	40.6%[+++]
O4 (LCDR)	18.5%	23.2%[+++]
O5 (CDR)	9.1%	11.0%[++]
O6 (CAPT)	2.7%	1.8%[+]
WO(1-5) (Warrant)	4.6%	2.7%[+++]
Occupation		
Health care	20.1%	8.1%[+++]
Supply	10.1%	14.5%[+++]
Sciences, Personnel, and Eng'g	12.4%	26.3%[+++]

Aviation	22.4%	18.6%[+++]
Naval Operations	35.0%	32.5%[+]
Gender		
Male	86.0%	90.1%[+++]
Female	14.0%	9.9%[+++]
Race/Ethnicity		
White	79.0%	75.7%
Black	7.8%	10.2%[+++]
Others	13.1%	14.1%
Marital Status		
Single no family	24.5%	26.3%[+]
Single with family	14.4%	11.1%[+++]
Married	60.9%	62.6%[+]
Education		
Bachelor's degree	44.2%	45.5%[++]
Master's degree or higher	32.1%	36.9%[++]
Other educational credentials	23.6%	17.5%[+++]
Environment of deployment		
Non-hostile	84.2%	64.9%[+++]
Hostile	23.8%	43.5%[+++]
Year of Deployment		
CY 2002	7.4%	4.7%[+++]
CY 2003	42.0%	30.7%[+++]
CY 2004	23.9%	20.3%[++]
CY 2005-2007	26.7%	44.3%[+++]
Age		
Age	34.1	34.6[++]
Sample size	10,210	1,245

+ t-statistic for differences in mean between the two samples, significant at the 0.10 level
++ t-statistic for differences in mean between the two samples, significant at the 0.05 level
+++ t-statistic for differences in mean between the two samples, significant at the 0.01 level

The preliminary analysis in Table 2 provides a comparative summary characteristic of officers who were never assigned an IA tour to officers who were assigned an IA tour. Overall, 40.6% of officers who deployed as an IA were Lieutenants (LT) while 33.5% have not yet been assigned an IA tour. Officers assigned to naval operations (32.5%) and to sciences, personnel, and engineering (26.3%) occupational groups are most likely to be assigned an IA tour. Additionally, officers in the naval operations (35%) and aviation (22.4%) occupational fields comprised the largest contingent of those who have not had an IA tour. Male officers are more likely to be

assigned an IA tour (90% vs. 86%, p<0.01). Likewise, Black officers are more likely to be assigned an IA tour (10% vs. 8%, p<0.01). About 64.9% of officers on IA assignment and 84.2% of officers not assigned an IA were deployed to non-hostile environments. In CY 2005-2007, 44.26% of officers were assigned an IA tour compared to 26.65% who have not had an IA tour. This 17.6% increase denotes increasing demand for Navy individual augmentee assets.

2. Characteristics of Health Assessment Survey Outcomes for Officers

Table 3 provides summary statistics of Pre- and Post-deployment Health Assessment survey outcomes for officers. The frequency table shows the distribution of the dependent variables for the officer sample.

Table 3.   Officer Health Assessment Survey Outcomes 2002-2007

	Officer who was never assigned to an IA tour	Officer who was an IA sometime during 2002-2007
	mean	**mean**
Pre-deployment		
Mental health referral	0.0%	0.0%
Seek mental health counsel	2.1%	1.9%
Report fair/poor health status	0.6%	0.1%[+]
Sample size	2,471	746
Post-deployment		
Mental health referral	0.4%	0.4%
Seek mental health counsel	0.9%	0.9%
Report fair/poor health status	1.4%	1.0%
Health status changed to worse	6.3%	7.6%[+]
Propensity to develop PTSD	2.1%	2.4%
Sample size	11,738	1,358

+   t-statistic for differences in mean between the two samples, significant at the 0.10 level
++   t-statistic for differences in mean between the two samples, significant at the 0.05 level
+++   t-statistic for differences in mean between the two samples, significant at the 0.01 level

Less than 1% of officers in both groups reported that their health status was fair to poor at the pre-deployment phase, although the non-IA samples have slightly higher share of fair/poor health than the IA samples (0.6% vs. 0.1%, p<0.1). All other pre-deployment health outcomes are statistically the same between the two populations. The percentage of officers who reported seeking mental health help actually decreased in the post-deployment survey. More officers who completed their IA tour reported that their health got worst (7.6% vs. 6.3%, p<0.1) compared to officers who have not been assigned an IA tour. There are no statistically significant differences between the two populations in the other four health outcomes examined.

3.   Characteristics of the Enlisted Cohort

Table 4 provides summary statistics of two groups of enlisted personnel. The first group consists of enlisted personnel who were never assigned an IA tour. The second group consists of enlisted personnel deployed as an IA between the periods of CY 2002 – CY 2007. The sample size was based on the respondents of the Pre- and Post-deployment Health Assessment questionnaire. The table shows the distribution of the control variables for the entire enlisted sample.

Table 4.   General Characteristics of Enlisted Personnel 2002-2007

	Enlisted who was never assigned to an IA tour	Enlisted who was an IA sometime during 2002-2007
	mean	**mean**
Rank Distribution		
Unknown rank	0.0%	0.1%[+++]
E1-E3	32.6%	14.2%[+++]
E4	27.2%	21.3%[+++]
E5	20.0%	28.9%[+++]
E6	13.0%	23.8%[+++]
E7	5.3%	9.4%[+++]
E8-E9	2.0%	2.3%
Occupation		
Deck	8.7%	18.9%[+++]
Weapons/Ordnance/Electronics	7.9%	7.9%

Administration/Other	16.2%	31.8%[+++]
Engineering/ Hull	22.9%	11.8%[+++]
Construction	6.0%	7.3%[+++]
Aviation	29.2%	10.2%[+++]
Medical	9.1%	12.2%[+++]
Gender		
Male	88.0%	88.0%
Female	12.0%	12.0%
Race/Ethnicity		
White	56.0%	55.9%
Black	21.5%	22.5%
Others	22.5%	21.7%
Marital Status		
Single	34.0%	48.3%[+++]
Single with dependents	1.3%	2.7%[+++]
Single: unknown dependents	49.1%	35.1%[+++]
Married-no dependents	4.3%	4.1%
Married with dependents	2.2%	3.9%[+++]
Unknown marital status	9.1%	6.0%[+++]
Education		
Non-high school graduate	1.9%	1.8%
High school graduate	85.9%	83.5%[+++]
Bachelor's degree	5.6%	8.5%[+++]
Master's and above	0.2%	0.3%[+++]
Other educational credentials	8.2%	7.7%
Environment of deployment		
Non-hostile	89.4%	75.7%[+++]
Hostile	15.8%	32.5%[+++]
Year of Deployment		
CY 2002	9.2%	7.1%[+++]
CY 2003	41.1%	30.5%[+++]
CY 2004	24.5%	23.7%
CY 2005-2007	25.2%	38.8%[+++]
Age		
Age	26.4	28.8
Sample size	95,314	3,461

+   t-statistic for differences in mean between the two samples, significant at the 0.10 level
++   t-statistic for differences in mean between the two samples, significant at the 0.05 level
+++ t-statistic for differences in mean between the two samples, significant at the 0.01 level

The preliminary analysis in Table 4 provides a summary of characteristics of two groups enlisted personnel. Second Class Petty Officers (E-5) comprised the largest proportion of the enlisted ranks (28.9%) deployed as IAs, followed by First Class Petty Officers (E-6) with 23.8%. Meanwhile, 32.6% of enlisted personnel below the rank of third class petty officer have not gone on an IA tour. Overall, 31.8% of the total sample of enlisted personnel who were deployed as an IA worked in an administrative or other specialty rating, while 29.2% of enlisted personnel in the aviation specialty rating were never assigned an IA tour.

Single enlisted sailors and single sailors with unknown number of dependents (48.3% and 39.1% respectively) comprised the largest proportion of enlisted sailors who were assigned an IA tour. In addition, these same groups of sailors also comprised the largest proportion of enlisted service members not assigned an IA tour.

High school graduates (83.5%) were more likely to be assigned an IA tour, compared to 85.9% of enlisted service members with the same educational level who were never assigned an IA tour.

Though non-hostile assignments comprise a majority of the deployments, IAs are more likely to be deployed to a hostile location (33% vs. 16%, $p<0.01$) than enlisted service member who were never assigned an IA tour. In addition, IA assignments are more likely to increase in the later years (39% vs. 25%, $p<0.01$).

Overall, the average age of enlisted personnel assigned an IA tour was 28.8 years old. These enlisted service members were on the average 2.4 years older than those enlisted service members who were not assigned an IA tour.

In summary, demographic variables indicate that a Second Class Petty Officer who works in an administrative/other occupational specialty rating, and is single with no dependents is most likely to be assigned an IA tour.

4. Characteristics of Health Assessment Survey Outcomes for Enlisted Personnel

Table 5 provides summary statistics of Pre- and Post-deployment Health Assessment survey outcomes for enlisted personnel. The frequency table shows the distribution of the dependent variables for the entire enlisted sample.

Table 5. Enlisted Personnel Health Assessment Survey Outcomes 2002-2007

	Enlisted who was never assigned to an IA tour	Enlisted who was an IA sometime during 2002-2007
	mean	**mean**
Pre-deployment		
Mental health referral	0.2%	0.1%
Seek mental health counsel	3.7%	2.8%$^{+++}$
Report fair/poor health status	2.9%	0.4%$^{+++}$
Sample size	22,074	2,108
Post-deployment		
Mental health referral	1.5%	1.0%$^{++}$
Seek mental health counsel	2.7%	1.9%$^{+++}$
Report fair/poor health status	5.0%	3.5%$^{+++}$
Health status changed to worse	8.5%	7.4%$^{++}$
Propensity to develop PTSD	3.9%	3.9%
Sample size	109,956	4,067

\+   t-statistic for differences in mean between the two samples, significant at the 0.10 level
\+\+   t-statistic for differences in mean between the two samples , significant at the 0.05 level
\+\+\+ t-statistic for differences in mean between the two samples, significant at the 0.01 level

Among the pre-deployment health outcomes, there are statistical significant differences between the non-IA and IA enlisted soldiers for the following: whether the soldier seeks mental health counsel and whether they report fair/poor health. In both cases, the IA sample reports lower incidences of adverse outcomes.

Among the post-deployment health outcomes, all except for propensity to develop PTSD are statistically significantly different between the two samples, and in all cases, the IA sample reported lower incidence of adverse health outcomes post-deployment.

In summary, enlisted personnel who had an IA assignment report less adverse mental and physiological health outcomes compared to enlisted service members who never had an IA tour, both in the Pre- and Post-deployment Health Assessment surveys.

VIII. MULTIVARIATE ANALYSIS AND RESULTS

This chapter presents the marginal effects of the three probit models employed in the study. Section A presents the officer and enlisted general models. Section B presents the interaction of an IA identifier and hostile deployment in the officer and enlisted general models. Section C presents the sensitivity analysis of the officer and enlisted general models. Section D is the summary of the effects of deployments on a Navy individual augmentee.

A.   MULTIVARIATE REGRESSIONS FOR THE GENERAL MODEL

1.   Marginal Effects of the Officer General Model

Table 6 presents the results of the regression for the Officer General Model. Marginal effects of the control variables are presented for ease in interpretation.

Table 6.   Marginal Effects of the Officer General Model

	Propensity to develop PTSD	Report health got worst after deployment	Mental health referrals (Post-deployment)	Sought/intend to seek mental health counseling (Post-deployment)	Health care provider health assessment : Fair/Poor (Post-deployment)
=1 if survey response correspond to an IA tour	1.0155	1.0077	0.9992	1.0161	0.9982
	(0.0116)	(0.0150)	(0.0019)	(0.0126)	(0.0057)
indicator for ever deployed as IA	0.9949	1.0133	1.0007	0.9975	0.9975
	(0.0039)	(0.0102)	(0.0019)	(0.0024)	(0.0035)
hostile deployment	1.0266***	1.0229***	1.0030**	1.0043**	1.0053**
	(0.0040)	(0.0062)	(0.0014)	(0.0019)	(0.0027)
Control Variables					
health care	1.0073	1.0173	1.0026	1.0111*	0.9980
	(0.0050)	(0.0110)	(0.0027)	(0.0057)	(0.0035)
sciences, personnel, and eng'g	0.9946	0.9993	0.9987	0.9999	0.9953
	(0.0034)	(0.0099)	(0.0013)	(0.0031)	(0.0031)
Aviation	0.9903***	0.9981	0.9984	0.9984	0.9933**
	(0.0032)	(0.0091)	(0.0013)	(0.0028)	(0.0029)
naval operations	0.9974	1.0175*	1.0015	1.0036	1.0045
	(0.0036)	(0.0092)	(0.0018)	(0.0032)	(0.0037)
Age	1.0003	1.0003	0.9998	0.9999	1.0016

	(0.0012)	(0.0025)	(0.0004)	(0.0007)	(0.0011)
Agesq	1.0000	1.0000	1.0000	1.0000	1.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Male	0.9889***	0.9662***	0.9993	0.9923***	0.9934*
	(0.0041)	(0.0082)	(0.0013)	(0.0029)	(0.0036)
Black	1.0042	0.9898	1.0025	1.0007	1.0029
	(0.0045)	(0.0077)	(0.0021)	(0.0025)	(0.0037)
other race/eth	1.0054	0.9968	1.0006	1.0037	1.0005
	(0.0037)	(0.0067)	(0.0014)	(0.0024)	(0.0030)
single no family	0.9975	1.0092	0.9987	0.9987	1.0019
	(0.0028)	(0.0067)	(0.0010)	(0.0017)	(0.0029)
single with family	0.9995	0.9969	1.0006	1.0003	1.0023
	(0.0032)	(0.0069)	(0.0013)	(0.0020)	(0.0031)
master's degree/higher	1.0004	1.0049	0.9990	1.0020	0.9996
	(0.0027)	(0.0061)	(0.0010)	(0.0019)	(0.0025)
other educational credentials	1.0037	1.0130*	1.0024*	1.0046*	1.0060*
	(0.0032)	(0.0067)	(0.0015)	(0.0024)	(0.0031)
CY 2003	0.9953	1.0134	0.9986	0.9939***	1.0033
	(0.0046)	(0.0111)	(0.0016)	(0.0023)	(0.0045)
CY 2004	1.0032	1.0000	0.9994	0.9972	1.0007
	(0.0054)	(0.0111)	(0.0015)	(0.0020)	(0.0046)
CY 2005-2007	0.9988	0.9992	0.9998	0.9961**	1.0024
	(0.0048)	(0.0110)	(0.0016)	(0.0020)	(0.0048)
Observations	11455	10858	11455	11455	11355

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Omitted category for occupation is supply and fiscal
Omitted category for gender is female
Omitted category for race/ethnicity is white
Omitted category for marital status is married
Omitted category for education is bachelor's degree
Omitted category for environment of deployment is non-hostile
Omitted category for year is CY 2002

Effects of Types of Deployment on Officers

There are no significant differences of an IA tour on officers in the study. The results of the study also indicate that there are no significant differences in health outcomes between the IA and non-IA samples.

A hostile deployment is a significant predictor for all the outcomes: propensity to develop PTSD, report of health getting worse after deployment, being referred for mental health evaluation, seeking or intending to seek mental health counseling after deployment, and a healthcare provider assessment of general health being fair/poor post

deployment. The results of the study indicate that adding one more hostile deployment had a higher probability of adverse mental and physiological health outcomes relative to a non-hostile deployment, holding all else constant. The effects range from 0.3 to 2.7 percentage points. The hostile deployment variable is significant at least at the 0.05 level for all outcomes.

Other Predictors (Officers)

There are few significant differences across the occupational groups we defined. One exception is that officers in the aviation occupation field have a one-percentage-point lower probability of developing PTSD relative to those in the supply and fiscal occupational group, holding all else constant. Officers in this occupational field have also a 0.7-percentage-point lower probability of being diagnosed as having poor/fair health by a healthcare provider relative to officers in the supply and fiscal occupational field, holding all else constant.

Being a male officer is a significant predictor, at least at the 0.10 level, for all outcomes with the exception of the mental health referrals post-deployment health outcome. The results of the study indicate that a male officer has a lower probability of adverse mental and physiological health outcomes compared to a female officer, holding all else constant. The effects range from 0.7 to 3.4 percentage points.

An officer with other educational credentials is also a significant predictor (at the 0.10 level) for all outcomes with the exception of the propensity to develop PTSD outcome. The results of the study indicate that an officer with other educational credentials had a higher probability of adverse mental and physiological health outcomes compared to an officer with a bachelor's degree, holding all else constant. The effects range from 0.2 to 1.3 percentage points. Other control variables used in the study had no significant or had only one significant estimate.

2. Marginal Effects of the Enlisted General Model

Table 7 presents the results of the regression for the Enlisted General Model. Marginal effects of the control variables are presented for ease in interpretation.

Table 7.　　　Marginal Effects of the Enlisted General Model

	Propensity to develop PTSD	Report health got worse after deployment	Mental health referrals (Post-deployment)	Sought/intend to seek mental health counseling (Post-deployment)	Health care provider health assessment : Fair/Poor (Post-deployment)
=1 if survey response correspond to an IA tour	0.9919	0.9833*	0.9985	0.9937	0.9993
	(0.0059)	(0.0100)	(0.0045)	(0.0056)	(0.0093)
indicator for ever deployed as IA	0.9967	0.9935	0.9959**	0.9930***	0.9921*
	(0.0033)	(0.0054)	(0.0018)	(0.0026)	(0.0040)
hostile deployment	1.0425***	1.0229***	1.0031***	1.0089***	1.0073***
	(0.0025)	(0.0030)	(0.0011)	(0.0017)	(0.0022)
Control Variables					
deck	0.9960	0.9734***	0.9905***	0.9967	0.9882***
	(0.0028)	(0.0038)	(0.0008)	(0.0025)	(0.0032)
weapons/ord/electronics	0.9965	0.9993	0.9922***	1.0010	1.0081*
	(0.0029)	(0.0048)	(0.0009)	(0.0028)	(0.0042)
admin/others	0.9989	0.9880***	0.9925***	1.0032	0.9990
	(0.0026)	(0.0039)	(0.0009)	(0.0025)	(0.0033)
eng'g / hull	0.9967	0.9892***	0.9912***	1.0039	1.0094***
	(0.0025)	(0.0039)	(0.0009)	(0.0025)	(0.0035)
aviation	0.9967	0.9941	0.9902***	0.9989	1.0016
	(0.0024)	(0.0039)	(0.0010)	(0.0022)	(0.0032)
medical	1.0256***	0.9824***	0.9978*	1.0178***	0.9835***
	(0.0040)	(0.0040)	(0.0013)	(0.0036)	(0.0029)
age	0.9988	0.9975**	1.0009*	1.0010	0.9975***
	(0.0008)	(0.0011)	(0.0005)	(0.0007)	(0.0008)
agesq	1.0000	1.0001***	1.0000**	1.0000*	1.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
male	0.9871***	0.9604***	0.9924***	0.9774***	0.9807***
	(0.0020)	(0.0032)	(0.0013)	(0.0020)	(0.0024)
black	1.0070***	1.0014	1.0000	0.9925***	1.0100***
	(0.0016)	(0.0023)	(0.0009)	(0.0011)	(0.0019)
other race/eth	1.0064***	0.9999	0.9981**	0.9927***	1.0130***
	(0.0015)	(0.0022)	(0.0008)	(0.0011)	(0.0019)
married with dependents	0.9961	0.9868**	0.9957**	0.9904***	0.9876***
	(0.0042)	(0.0063)	(0.0021)	(0.0028)	(0.0045)
single	0.9878***	0.9851***	0.9935***	0.9891***	0.9881***

	(0.0025)	(0.0042)	(0.0014)	(0.0021)	(0.0031)
single with dependents	0.9923*	0.9919	0.9949**	0.9941	0.9925
	(0.0045)	(0.0080)	(0.0023)	(0.0038)	(0.0058)
single: unknown dependents	0.9920***	0.9991	0.9965**	0.9948**	0.9995
	(0.0028)	(0.0045)	(0.0016)	(0.0024)	(0.0034)
unknown marital status	0.9917***	0.9981	0.9998	0.9971	1.0027
	(0.0028)	(0.0054)	(0.0019)	(0.0026)	(0.0043)
non-high school grad	1.0004	1.0031	0.9979	0.9963	0.9990
	(0.0044)	(0.0072)	(0.0023)	(0.0034)	(0.0053)
bachelor's	0.9996	1.0026	0.9986	0.9997	0.9941**
	(0.0027)	(0.0040)	(0.0016)	(0.0023)	(0.0029)
master's/above	0.9996	1.0034	0.9981	0.9941	0.9736***
	(0.0132)	(0.0200)	(0.0077)	(0.0099)	(0.0098)
other educational cred	1.0090***	1.0180***	1.0042***	1.0087***	1.0093***
	(0.0026)	(0.0041)	(0.0016)	(0.0023)	(0.0031)
CY 2003	1.0015	1.0170***	0.9954***	0.9976	1.0032
	(0.0022)	(0.0036)	(0.0013)	(0.0018)	(0.0025)
CY 2004	1.0039	0.9991	1.0026*	0.9992	0.9930***
	(0.0024)	(0.0037)	(0.0015)	(0.0019)	(0.0025)
CY 2005-2007	1.0007	0.9963	1.0025*	1.0022	0.9935**
	(0.0024)	(0.0037)	(0.0015)	(0.0021)	(0.0026)
Observations	98775	95215	98775	98774	97626

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%
Omitted category for occupation is construction
Omitted category for gender is female
Omitted category for race/ethnicity is white
Omitted category for marital status is married no dependents
Omitted category for education is high school graduate
Omitted category for environment of deployment is non-hostile
Omitted category for year is CY 2002

Effect of Types of Deployments on Enlisted Service Members

For the report of health getting worst after deployment outcome, an enlisted service member sent on an IA tour has a 1.7-percentage-point-lower probability of reporting their health getting worse after deployment compared to an enlisted service member on a non-IA tour, holding all else constant. Being an enlisted IA was not a significant predictor for the rest of the outcomes.

An enlisted service member identified as an individual augmentee at anytime during CY 2002-2007 is a significant predictor for being referred for mental health evaluation, seeking or intending to seek mental health counseling, and a healthcare provider assessment of general health being fair/poor post deployment outcomes. The results of the study indicate that an enlisted service member identified as an IA at anytime during CY 2002-2007 had a lower probability of adverse mental and physiological health outcomes relative to a non-IA, holding all else constant. The effect ranges from 0.4 to 0.8 percentage points.

A hostile deployment is a significant predictor (at the 0.01 level) for all the outcomes: propensity to develop PTSD, report of health getting worse after deployment, being referred for mental health evaluation, seeking or intending to seek mental health counseling after deployment, and a healthcare provider assessment of general health being fair/poor post deployment. The results of the study indicate that adding one more hostile deployment had a higher probability of adverse mental and physiological health outcomes relative to a non-hostile deployment, holding all else constant. The effects range from 0.3 to 4.3 percentage points.

Other Predictors (Enlisted)

An enlisted service member in the medical rating is a significant predictor for all the outcomes. For the propensity to develop PTSD (significant at the 0.01 level) and seek or intend to seek mental health counseling post-deployment (significant at the 0.01 level) outcomes, the results of the study indicate that these outcomes have a higher probability of adverse mental health outcomes relative to an enlisted service member in the construction rating, holding all else constant. The effects range from 1.8 to 2.6 percentage points. Meanwhile, for the outcomes report of health getting worse after deployment; being referred for mental health evaluation; and healthcare provider assessment of general health being fair or poor post-deployment have an opposite effect. The results of the study indicate that an enlisted service member in the medical rating had a lower probability of an adverse mental and physiological health outcome relative to his or her

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counterpart in the construction rating, holding all else constant. The effects range from 0.2 to 1.8 percentage points. The medical rating control variable is significant at least at the 0.10 level.

Being a male enlisted service member is a significant predictor for all outcomes. The results of the study indicate that a male enlisted service member has a lower probability of adverse mental and physiological health outcomes compared to their female counterpart, holding all else constant. The effects range from 0.8 to 4 percentage points, which are significant at the 0.01 level.

An enlisted service member being African-American is a significant predictor for the outcomes propensity to develop PTSD, seek or intend to seek mental health counseling, and a healthcare assessment of general health being fair/poor post-deployment. The results of the study indicate that being African-American was associated with a higher probability of developing PTSD (0.7 percentage points) or being diagnosed with a fair/poor health (one percentage point) relative to a white enlisted service member, holding all else constant. These estimates are significant at the 0.01 level. In contrast, the study shows that being African-American had an opposite (negative) effect to the outcome seek or intend to seek mental health counseling post-deployment (significant at the 0.01 level). The results of these findings were also consistent with those enlisted service members belonging to other races with the exception of the mental health referral post-deployment outcome. The results of the study indicate that an enlisted service member belonging to other race/ethnicity had a 0.2-percentage-point lower probability of being referred for mental health evaluation (significant at the 0.05 level) relative to an enlisted service member belonging to the white race, holding all else constant.

Being married and having dependents are significant predictors for the outcomes: report of health getting worse after deployment (significant at the 0.05 level), being referred for mental health evaluations post-deployment (significant at the 0.05 level), seek or intend to seek mental health counseling post-deployment (significant at the 0.01 level), and being diagnosed with a fair/poor health (significant at the 0.01 level). The results of the study indicate that an enlisted service member who is married and has dependents has a lower probability of an adverse mental or physiological health outcome

relative to his or her counterpart who is married and has no dependents, holding all else constant. The effects range from 0.4 to 1.3 percentage points.

The study also shows an enlisted service member with marital status of single with no dependents is a significant predictor for all the outcomes: propensity to develop PTSD, report of health getting worse after deployment, being referred for mental health evaluation, seeking or intending to seek mental health counseling after deployment, and a healthcare provide assessment of general health being fair/poor post deployment. The results of the study indicate that an enlisted service member who is single with no dependents has a lower probability of adverse mental and physiological health outcomes relative to an enlisted service member who is married and has no dependents, holding all else constant. The effects range from 0.7 to 1.5 percentage points. The estimates are significant at the 0.01 level for all outcomes.

An enlisted service member with other educational credentials is also a significant predictor for all the outcomes: propensity to develop PTSD, report of health getting worse after deployment, being referred for mental health evaluation, seeking or intending to seek mental health counseling after deployment, and a healthcare provider assessment of general health being fair/poor post deployment. The results of the study indicate that an enlisted service member with other educational credentials have a higher probability of adverse mental and physiological health outcomes relative to his or her counterpart with a high school diploma, holding all else constant. The effects range from 0.4 to 1.8 percentage points. This control variable is significant at the 0.01 level for all outcomes.

B.   MULTIVARIATE REGRESSIONS FOR THE INTERACTION MODEL

1.   Marginal Effects of the Officer Interaction Model

Table 8 presents the results of the regression for the officer interaction model. Marginal effects of the control variables are presented for ease in interpretation. The marginal effects of the other control variables were discussed in Section A. Only the interaction variables are discussed in this section.

Table 8.   **Marginal Effects of the Officer Interaction Model**

	Propensity to develop PTSD	Report health got worst after deployment	Mental health referrals (Post-deployment)	Sought/intend to seek mental health counseling (Post deployment)	Health care provider health assessment : Fair/Poor (Post-deployment)
=1 if survey response correspond to an IA tour	1.0052	0.9806	0.9971***	1.0175	1.0105
	(0.0199)	(0.0189)	(0.0006)	(0.0197)	(0.0170)
indicator for ever deployed as IA	0.9915*	1.0153	1.0023	0.9982	0.9952
	(0.0048)	(0.0122)	(0.0024)	(0.0032)	(0.0038)
hostile deployment	1.0248***	1.0214***	1.0025**	1.0046**	1.0051*
	(0.0041)	(0.0066)	(0.0011)	(0.0020)	(0.0028)
Interaction Term Results					
(=1 if survey response correspond to an IA tour)*(hostile_deploy)	1.0049	1.0554	2.7164***	1.0008	0.9904***
	(0.0221)	(0.0531)	(0.0005)	(0.0099)	(0.0031)
(indicator for ever deployed as IA) *(hostile_deploy)	1.0123	0.9943	0.9967***	0.9977	1.0113
	(0.0170)	(0.0183)	(0.0007)	(0.0049)	(0.0151)
Observations	11455	10858	11455	11455	11355

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Omitted category for environment of deployment is non-hostile

<u>Interaction between an IA Tour and Hostile Deployment</u>

An IA tour to a hostile location is a significant predictor for having mental health referrals post-deployment. The results of the study indicate that an IA tour to a hostile location increases the probability of being referred for mental health evaluation by a very large amount, but this large estimate is likely the result of few cases for this outcome. This is consistent with the low probability of adverse mental health outcomes reported in Chapter VII Descriptive Statistics

An IA tour to a hostile location is also a significant predictor for a healthcare provider assessment of general health being fair or poor, although the practical magnitude is trivial. The results of the study indicate that that an IA tour to a hostile location has a one-percentage-point lower probability of a healthcare provider assessment of general health being fair or poor compared to a non-IA tour to a hostile location, holding all else constant.

<u>Interaction between IA Sample and Hostile Deployment (IA sample are those who were ever deployed as IAs)</u>

Being ever deployed as an IA is a significant predictor for being referred for mental health evaluation post-deployment. The results of the study indicate that those who were ever deployed as an IA to a hostile location have a 0.3-percentage-point lower probability of being referred for mental health evaluation compared to the non-IA sample deployed to a hostile location, holding all else constant.

2.   Marginal Effects of the Enlisted Interaction Model

Table 9 presents the results of the regression for the enlisted interaction model. Marginal effects of the control variables are presented for ease in interpretation. The marginal effects of the other control variables were discussed in Section A. Only the interaction variables are discussed in this section.

Table 9.   Marginal Effects of the Enlisted Interaction Model

	Propensity to develop PTSD	Report health got worst after deployment	Mental health referrals (Post-deployment)	Sought/intend to seek mental health counseling (Post-deployment)	Health care provider health assessment : Fair/Poor (Post-deployment)
=1 if survey response correspond to an IA tour	0.9806**	1.0135	1.0021	0.9991	1.0075
	(0.0082)	(0.0200)	(0.0088)	(0.0109)	(0.0155)
indicator for ever deployed as IA	0.9934*	0.9836***	0.9940***	0.9892***	0.9903**
	(0.0040)	(0.0059)	(0.0019)	(0.0028)	(0.0045)
hostile deployment	1.0416***	1.0218***	1.0028**	1.0083***	1.0072***
	(0.0025)	(0.0031)	(0.0011)	(0.0017)	(0.0023)
Interaction Term Results					
(=1 if survey response correspond to an IA tour)*(hostile_deploy)	1.0229	0.9511***	0.9935	0.9876	0.9848
	(0.0293)	(0.0113)	(0.0054)	(0.0082)	(0.0141)
(indicator for ever deployed as IA)*(hostile_deploy)	1.0105	1.0450***	1.0101	1.0200*	1.0091
	(0.0091)	(0.0176)	(0.0083)	(0.0115)	(0.0122)
Observations	98775	95215	98775	98774	97626

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Omitted category for environment of deployment is non-hostile

<u>Interaction between an IA Tour and Hostile Deployment</u>

An IA tour to a hostile location is a significant predictor for only one outcome: report of health getting worse after deployment. The results of the study indicate that an IA tour to a hostile location has a 4.9-percentage-point lower probability of reports of health getting worse after deployment compared to a non-IA tour to a hostile location, holding all else constant. An IA tour to a hostile location was not a significant predictor for the rest of the dependent variables.

<u>Interaction between IA Sample and Hostile Deployment (IA sample are those who were ever deployed as IAs)</u>

The IA sample deployed to a hostile location is a significant predictor for report of health getting worse after deployment. The results of the study indicate that those who were ever deployed as an IA to a hostile location had a 4.5-percentage-point higher probability of reporting health getting worse after deployment compared to the non-IA sample deployed to a hostile location, holding all else constant.

The study also shows that the IA sample deployed to a hostile location is a significant predictor for seeking or intending to seek mental health counseling post-deployment. The results indicate that those who were ever deployed as an IA to a hostile location have a 2-percentage-point higher probability of seeking or intending to seek mental health counseling post-deployment compared to the non-IA sample deployed to a hostile location, holding all else constant.

C. SENSITIVITY ANALYSES

A sensitivity analysis was conducted to observe if the coefficients of the key variables were stable. For this study, an analysis on a reduced sample-size of matching responses in the Pre- and Post-deployment Health Assessment questionnaire was conducted to observe if the coefficients' directions are similar between the general model and the sensitivity results. The sensitivity analysis was also used to observe if the results on the key variables changed when there is a control for a baseline.

1. Sensitivity Analysis for the Officer Model

The general model was re-estimated on the three health outcomes (mental health referrals, seeking mental health counsel, and healthcare provider health assessments) using a matched sample between Pre- and Post-deployment Health Assessment questionnaire. After a matched sample was obtained, the sample size was reduced by over 75%.

The coefficients of the key variables in the General Model were very close to the coefficients of the key variables in the sensitivity table thus we could conclude that the Officer General Model is stable.

The same procedure was applied in the interaction model on the three health outcomes (mental health referrals, sought/intend to seek mental health counseling, and health care provider health assessment) using a matched sample between Pre- and Post-deployment Health Assessment questionnaire. After a matched sample was obtained, the sample size was also reduced by over 75%.

Likewise, the coefficients of the key variables in the Officer Interaction Model were very close to the coefficients of the key variables in the sensitivity table thus we could conclude that the Officer Interaction Model is stable.

Table 10.   Sensitivity Analysis Results for the Officer Models

	Sensitivity Analysis for the Officer General Model		
	Mental health referrals (Post - Pre deployments)	Sought/intend to seek mental health counseling (Post - Pre deployments)	HCP health assessment: Fair/Poor (Post - Pre deployments)
=1 if survey response correspond to an IA tour	0.9998 (0.0002)	1.0014 (0.0041)	0.9967 (0.0042)
indicator for ever deployed as IA	1.0004 (0.0006)	1.0005 (0.0028)	1.0011 (0.0045)
hostile deployment	1.0005 (0.0004)	1.0018 (0.0018)	0.9999 (0.0030)
	Sensitivity Analysis for the Officer Interaction Model		
=1 if survey response	0.9997	1.0029	1.0006

correspond to an IA tour	(0.4901)	(0.0083)	(0.0105)
indicator for ever deployed as IA	1.0007 (0.9280)	1.0004 (0.0038)	0.9965 (0.0048)
hostile deployment	1.0003 (0.4243)	1.0020 (0.0020)	0.9984 (0.0033)
(=1 if survey response correspond to an IA tour)*(hostile_deploy)	2.7183*** (0.0225)	0.9988 (0.0044)	0.9937 (0.0048)
(indicator for ever deployed as IA)*(hostile_deploy)	0.9994 (0.7852)	1.0001 (0.0052)	1.0191 (0.0223)
Sample size	2207	2877	2834

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Omitted category for environment of deployment is non-hostile

2. Sensitivity Analysis for the Enlisted Model

The same procedure used in the Officer General Model was applied to the Enlisted General Model on the three health outcomes (mental health referrals, sought/intend to seek mental health counseling, and healthcare provider health assessments) using a matched sample between Pre- and Post-deployment Health Assessment questionnaire. After a matched sample was obtained, the sample size was also reduced by over 75%.

The coefficients of the key variables in the Enlisted General Model were very close to the coefficients of the key variables in the sensitivity table thus we could conclude that the Enlisted General Model is stable.

The same procedure was again applied in the Enlisted Interaction Model on the three health outcomes (mental health referrals, sought/intend mental health counseling, and health care provider health assessment) using a matched sample between Pre- and Post-deployment Health Assessment questionnaire. After a matched sample was obtained, the sample size was also reduced by over 75%.

The coefficients of the key variables in the Enlisted Interaction Model were very close to the coefficients of the key variables in the sensitivity table thus we could conclude that the Enlisted Interaction Model is stable.

Table 11. **Sensitivity Analysis Results for the Enlisted Models**

	Sensitivity Analysis for the Enlisted General Model		
	Mental health referrals (Post deploy - Pre deploy)	Sought/intend to seek mental health counseling (Post deploy - Pre deploy)	HCP health assessment: Fair/Poor (Post deploy - Pre deploy)
=1 if survey response correspond to an IA tour	0.9908*** (0.0034)	0.9884*** (0.0037)	1.0069 (0.0104)
indicator for ever deployed as IA	0.9978 (0.0031)	0.9997 (0.0038)	1.0049 (0.0059)
hostile deployment	1.0045** (0.0020)	1.0118*** (0.0027)	1.0081** (0.0034)
	Sensitivity Analysis for the Enlisted Interaction Model		
=1 if survey response correspond to an IA tour	1.0010 (0.0139)	1.0049 (0.0142)	1.0259 (0.0219)
indicator for ever deployed as IA	0.9929** (0.0033)	0.9955 (0.0045)	0.9984 (0.0066)
hostile deployment	1.0038* (0.0020)	1.0115*** (0.0028)	1.0071** (0.0036)
(=1 if survey response correspond to an IA tour) *(hostile deploy)	0.9879*** (0.0026)	0.9832*** (0.0024)	0.9799** (0.0089)
(indicator for ever deployed as IA)*(hostile_deploy)	1.0211 (0.0161)	1.0125 (0.0119)	1.0212 (0.0161)
Sample size	20847	20846	20395

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Omitted category for environment of deployment is non-hostile

D.   SUMMARY

The factors affecting the mental and physiological health outcomes for officers and enlisted service members are different, thus requiring different models for estimation. The results of the analyses reveal that the officers' physiological health outcomes are not worse after an IA tour. However, the results of the study show that an officer on an IA tour deployed to a hostile location increases the likelihood of getting a mental health referral post-deployment relative to a non-IA tour to a hostile environment, holding all else constant.

An officer assigned to a hostile deployment, in general, increases the probability of adverse mental and physiological health outcomes. The marginal effects of a hostile deployment on an officer indicate that there is an increased probability of adverse mental or physiological health outcomes.

Enlisted service members do not appear to be affected by an IA assignment. In fact, they have lower probabilities of adverse mental or physiological health outcomes. There were no statistically significant differences between the interaction variable with the dependent variables propensity to develop PTSD, have a mental health referral post-deployment, sought or intend to undergo mental health counseling, and healthcare provider assessment of general health being fair or poor

An enlisted service member assigned to a hostile deployment, in general, increases the probability of adverse mental and physiological health outcomes. The marginal effects of a hostile deployment on an enlisted service member indicate that there is an increased probability of adverse mental or physiological health outcomes.

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IX.   CONCLUSIONS AND RECOMMENDATIONS

A.   CONCLUSION

The increase in operational demands on the Global War on Terror has put a strain on military manpower. The Navy has provided sailors to augment or support contingency operations in order for other Services to effectively perform their missions. Sailors who leave their current command and deploy as an individual or with a small group to augment or support contingency operations are known as individual augmentees. Former Chief of Naval Operations Admiral Mike Mullen stated at an all hands call at Camp McCrady, South Carolina that individual augmentee duty is a long-term commitment of the Navy. Given the increasing mobilization of individual augmentees, an understanding of the effects of deployment on their mental health is imperative. This study attempts to measure the possible effects of deployments on the mental health outcomes of Navy individual augmentees.

1.   Research Question

The research question of this study was to determine the effects of deployment (hostile and non-hostile) on the mental health outcomes of Navy individual augmentees. The study separated the effects of deployments on officer and enlisted personnel.

There were no significant statistical differences on the mental and physiological health variables for an officer on an IA tour. An officer who completed an IA-tour does not appear to have his or her health adversely affected. However, a hostile deployment increased the probability of adverse mental and physiological health outcomes. Moreover, an IA officer assigned to a hostile location substantially increases the probability of getting a mental health referral compared to a non-IA officer who is also assigned to a hostile region.

Individual augmentee deployments assigned to enlisted service members does not appear to adversely affect their mental and physiological health outcomes. The only

significant difference pertained to the report of health getting worse after deployment. A hostile deployment, in general, increases the probability of adverse mental and physiological health outcomes. However, an enlisted service member on an IA deployment to a hostile location has a lesser probability of an adverse mental and physiological health outcome compared to a non-IA enlisted service member who is also assigned to a hostile region. The only significant difference was that an enlisted member is less likely to report his or her health status getting worse after a deployment.

2. Recommendations for Future Research

Adverse mental health conditions do not manifest immediately after service members return from deployment. Some adverse psychological and physiological symptoms emerged several months post-deployment. Milliken, Auchterloine, and Hoge (2007) stated that the use of the post-deployment health assessment questionnaire might be too early to assess for mental health problems.

A follow-up study of individual augmentees using the Post-Deployment Health Reassessment form (DD Form 2900) provides the opportunity for healthcare providers to assess if changes to their mental health occur several months after they return from deployment. The Post-deployment Health Reassessment Program is a reassessment of the service member's health 3 to 6 months after he or she returns from deployment.

This thesis studied the effects of Navy active duty individual augmentee deployment/s on their mental health outcomes. It is recommended to increase the scope of the study to include Navy reservists since they comprise about 50% of all Navy individual augmentee deployments.

APPENDIX A. PRE-DEPLOYMENT HEALTH ASSESSMENT QUESTIONNAIRE (DD FORM 2795)

Military service members must complete the pre-deployment health assessment questionnaire (DD Form 2795) thirty days prior to deployment. When completion this form provides information about the general health of the military service member. It also helps health care providers identify pre-deployment health issues and provide appropriate medical care prior to deployment.

PRE-DEPLOYMENT Health Assessment

33823

Authority: 10 U.S.C. 136 Chapter 55. 1074f, 3013, 5013, 8013 and E.O. 9397

Principal Purpose: To assess your state of health before possible deployment outside the United States in support of military operations and to assist military healthcare providers in identifying and providing present and future medical care to you.

Routine Use: To other Federal and State agencies and civilian healthcare providers, as necessary, in order to provide necessary medical care and treatment.

Disclosure: **(Military personel and DoD civilian Employees Only)** Voluntary. If not provided, healthcare WILL BE furnished, but comprehensive care may not be possible.

INSTRUCTIONS: Please read each question completely and carefully before marking your selections. Provide a response for each question. If you do not understand a question, ask the administrator.

Demographics

Last Name

Today's Date (dd/mm/yyyy)

First Name   MI

Social Security Number

Deploying Unit

DOB (dd/mm/yyyy)

Gender
- O Male
- O Female

Service Branch
- O Air Force
- O Army
- O Coast Guard
- O Marine Corps
- O Navy
- O Other

Component
- O Active Duty
- O National Guard
- O Reserves
- O Civilian Government Employee

Pay Grade

O E1	O O1	O W1
O E2	O O2	O W2
O E3	O O3	O W3
O E4	O O4	O W4
O E5	O O5	O W5
O E6	O O6	O Other
O E7	O O7	
O E8	O O8	
O E9	O O9	
	O O10	

Location of Operation
- O Europe
- O SW Asia
- O SE Asia
- O Asia (Other)
- O South America
- O Australia
- O Africa
- O Central America
- O Unknown

Deployment Location (IF KNOWN) (CITY, TOWN, or BASE):

List country (IF KNOWN):

Name of Operation:

Administrator Use Only

Indicate the status of each of the following:

Yes	No	N/A	
O	O	O	Medical threat briefing completed
O	O	O	Medical information sheet distributed
O	O	O	Serum for HIV drawn within 12 months
O	O	O	Immunizations current
O	O	O	PPD screening within 24 months

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DD FORM 2795, MAY 1999   ASD (HA) APPROVED SEPTEMBER 1998 Ver 1.3

33823

PLEASE FILL IN SOCIAL SECURITY # ☐☐☐ – ☐☐ – ☐☐☐☐

Health Assessment

1. Would you say your health in general is: ○ Excellent ○ Very Good ○ Good ○ Fair ○ Poor

2. Do you have any medical or dental problems? ○ Yes ○ No

3. Are you currently on a profile, or light duty, or are you undergoing a medical board? ○ Yes ○ No

4. Are you pregnant? (FEMALES ONLY) ○ Don't Know ○ Yes ○ No

5. Do you have a 90-day supply of your prescription medication or birth control pills? ○ N/A ○ Yes ○ No

6. Do you have two pairs of prescription glasses (if worn) and any other personal medical equipment? ○ N/A ○ Yes ○ No

7. During the past year, have you sought counseling or care for your mental health? ○ Yes ○ No

8. Do you currently have any questions or concerns about your health? ○ Yes ○ No

Please list your concerns: _____

_____

Service Member Signature

I certify that responses on this form are true. ☐

Pre-Deployment Health Provider Review (For Health Provider Use Only)

After interview/exam of patient, the following problems were noted and categorized by Review of Systems. More than one may be noted for patients with multiple problems. Further documentation of problem to be placed in medical records.

REFERRAL INDICATED

○ None
○ Cardiac
○ Combat / Operational Stress Reaction
○ Dental
○ Dermatologic
○ ENT
○ Eye
○ Family Problems
○ Fatigue, Malaise, Multisystem complaint

○ GI
○ GU
○ GYN
○ Mental Health
○ Neurologic
○ Orthopedic
○ Pregnancy
○ Pulmonary
○ Other _____

FINAL MEDICAL DISPOSITION: ○ Deployable ○ Not Deployable

Comments: (If not deployable, explain)

_____

_____

_____

I certify that this review process has been completed.
Provider's signature and stamp:

Date (dd/mm/yyyy)

☐☐ / ☐☐ / ☐☐☐☐

End of Health Review

Reset

33823

DD FORM 2795, MAY 1999   ASD (HA) APPROVED SEPTEMBER 1998 Ver 1.3

APPENDIX B. POST-DEPLOYMENT HEALTH ASSESSMENT QUESTIONNAIRE (DD FORM 2796)

Military service members are required to complete the DD Form 2796 if DD Form 2795 was required during the pre-deployment phase. The completion of the form is also required when the commander exercising operational control deems that health threats have evolved or exposures to chemical, biological, radiological, and nuclear have occurred during deployment. The current version of DD Form 2796 dated September 2007 replaced the previous version dated April 2003. This study did not include the new version of DD Form 2796.

Please answer all questions in relation to THIS deployment

1. Did your health change during this deployment?

   O Health stayed about the same or got better
   O Health got worse

2. How many times were you seen in sick call during this deployment? ☐☐ No. of times

3. Did you have to spend one or more nights in a hospital as a patient during this deployment?

   O No
   O Yes, reason/dates: _____
   _____
   _____

4. Did you receive any vaccinations just before or during this deployment?

   O Smallpox (leaves a scar on the arm)
   O Anthrax
   O Botulism
   O Typhoid
   O Meningococcal
   O Other, list: _____
   O Don't know
   O None

5. Did you take any of the following medications during this deployment?
   (mark all that apply)
   O PB (pyridostigmine bromide) nerve agent pill
   O Mark-1 antidote kit
   O Anti-malaria pills
   O Pills to stay awake, such as dexedrine
   O Other, please list _____
   O Don't know

6. Do you have any of these symptoms now or did you develop them anytime <u>during this deployment?</u>

No	Yes During	Yes Now		No	Yes During	Yes Now	
O	O	O	Chronic cough	O	O	O	Chest pain or pressure
O	O	O	Runny nose	O	O	O	Dizziness, fainting, light headedness
O	O	O	Fever	O	O	O	Difficulty breathing
O	O	O	Weakness	O	O	O	Still feeling tired after sleeping
O	O	O	Headaches	O	O	O	Difficulty remembering
O	O	O	Swollen, stiff or painful joints	O	O	O	Diarrhea
O	O	O	Back pain	O	O	O	Frequent indigestion
O	O	O	Muscle aches	O	O	O	Vomiting
O	O	O	Numbness or tingling in hands or feet	O	O	O	Ringing of the ears
O	O	O	Skin diseases or rashes				
O	O	O	Redness of eyes with tearing				
O	O	O	Dimming of vision, like the lights were going out				

7. Did you see anyone wounded, killed or dead during this deployment?
   (mark <u>all</u> that apply)

   O No   O Yes - coalition   O Yes - enemy   O Yes - civilian

8. Were you engaged in direct combat where you discharged your weapon?

   O No   O Yes (O land   O sea   O air)

9. During this deployment, did you ever feel that you were in great danger of being killed?

   O No   O Yes

10. Are you currently interested in receiving help for a stress, emotional, alcohol or family problem?

    O No   O Yes

11. Over the LAST 2 WEEKS, how often have you been bothered by any of the following problems?

None	Some	A Lot	
O	O	O	Little interest or pleasure in doing things
O	O	O	Feeling down, depressed, or hopeless
O	O	O	Thoughts that you would be better off dead or hurting yourself in some way

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DD FORM 2796, APR 2003

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12. Have you ever had any experience that was so frightening, horrible, or upsetting that, IN THE PAST MONTH, you ....

No	Yes	
O	O	Have had any nightmares about it or thought about it when you did not want to?
O	O	Tried hard not to think about it or went out of your way to avoid situations that remind you of it?
O	O	Were constantly on guard, watchful, or easily startled?
O	O	Felt numb or detached from others, activities, or your surroundings?

13. Are you having thoughts or concerns that ...

No	Yes	Unsure	
O	O	O	You may have serious conflicts with your spouse, family members, or close friends?
O	O	O	You might hurt or lose control with someone?

14. While you were deployed, were you exposed to:
(mark all that apply)

No	Sometimes	Often	
O	O	O	DEET insect repellent applied to skin
O	O	O	Pesticide-treated uniforms
O	O	O	Environmental pesticides (like area fogging)
O	O	O	Flea or tick collars
O	O	O	Pesticide strips
O	O	O	Smoke from oil fire
O	O	O	Smoke from burning trash or feces
O	O	O	Vehicle or truck exhaust fumes
O	O	O	Tent heater smoke
O	O	O	JP8 or other fuels
O	O	O	Fog oils (smoke screen)
O	O	O	Solvents
O	O	O	Paints
O	O	O	Ionizing radiation
O	O	O	Radar/microwaves
O	O	O	Lasers
O	O	O	Loud noises
O	O	O	Excessive vibration
O	O	O	Industrial pollution
O	O	O	Sand/dust
O	O	O	Depleted Uranium (If yes, explain) _____
O	O	O	Other exposures _____

15. On how many days did you wear your MOPP over garments? □□ No. of days

16. How many times did you put on your gas mask because of alerts and NOT because of exercises? □□ No. of times

17. Were you in or did you enter or closely inspect any destroyed military vehicles?

O No   O Yes

18. Do you think you were exposed to any chemical, biological, or radiological warfare agents during this deployment?

O No   O Don't know
O Yes, explain with date and location

_____
_____
_____

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LIST OF REFERENCES

Adler, A. B. (2004, February 15). *Post traumatic stress symptoms in US veterans of the Gulf War.* US Army Medical Army Research Unit-Europe. Retrieved November 25, 2007, from http;//stinet.dtic.mil/cgi-bin/GetTRDoc?A0=A288542&Location=u2&doc=GetTRDoc =GetTRDoc.pdf.

Adler, A. B., McGurk, D., Stetz, M.C., & Bliese, P.D. (2003, March 21). Military occupational stressors in garrison, training, and deployed environments. Paper presented at the NIOSH/APA Symposium, Toronto, Canada.

Ahronson, A. & Cameron, J.E. (2007). The nature and consequences of group cohesion in a military sample. *Military Psychology,* 19(1), 9-25.

Assistant Secretary of Defense, Public Affairs. (2007). *DoD personnel and military casualty statistics*. U.S. active duty military deaths 1980 through 2006 (as of November 22, 2007). Retrieved November 23, 2007, from http:// siadapp.dmdc.osd.mil/personnel/CASUALTY/Death_Rates1.pdf.

Bliese, P.D., Wright, K.M., Adler, A.B., & Thomas, J.L. (2006). Psychological screening validation with soldiers returning from combat. In M.J. Roy (Ed.), *Novel approaches to the diagnosis and treatment of posttraumatic disorder* (pp. 78-86). Fairfax, VA: IOS Press.

Bliese, P.D., Wright, K.M., Thomas, J.L., Adler, A.B., & Hoge C.W. (2004, December). *Post-deployment mental health screening instruments: How good are they?* Retrieved December 15, 2007, from http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=ADA433073& Location=U2&doc=GetTRDoc.pdf.

Bliese, P.D., Wright, K.M., Adler, A., Thomas, J., & Hoge, C.W. (2004) *Research report 2004-001: Screening for traumatic stress among re-deploying soldiers*. Retrieved January 9, 2008, from http://www.usamru-e,hqusaeur.army.mil/Traumatic%20Stress%20Screen%20Validation%Report1.pd f 2008).

Bozeman, S., Hadden, L., Harrison, H., & Royal, S. (2006, December 30). *2003-2004 Active duty health study: Revised final report.* Cambridge, MA: Abt Associates Inc.

Brailey, K., Vasterling, J.J., Proctor, S.P., Constans, J.I., & Friedman, M.J. (2007, August). PTSD symptoms, life events, and unit cohesion in US soldiers: Baseline findings from the neurocognition deployment health study. *Journal of Traumatic Stress*, 20(4), 495-503.

Bray, R.M., Hourani, L.L., Olmsted, K.L.R., Witt, M., Brown, J.M., & Pemberton, M.R. (2006, December). *2005 Department of Defense survey of health related behaviors among active duty military personnel.* Research Triangle Park, NC: RTI International.

Chairman of the Joint Chiefs of Staff. (2004, January 1). Individual augmentation procedures (CJCSI 1301.01C). Washington, DC: CJCS Information Management Division. Retrieved October 11, 2007, from http://www .dtic.mil/cjcs_directives/index.htm.

Chief of Naval Operations. (2000, July 5). Individual Augmentation (IA) policy and procedures (OPNAV Instruction 1001.24). Retrieved October 11, 2007, from http://doni.daps.dla.mil/ Directives/01000%20Military%20Personnel%20Support/01- 01%20General%20Military %20Personnel%20Records/1001.24.pdf.

Chief of Naval Operations (CNO). (2006a). Official recognition and accurate tracking of navy global war on terrorism individual augmentation (NAVADMIN 300/06). Retrieved November 12, 2007, from http://www.npc.navy.mil/ReferenceLibrary/Messages/.

Chief of Naval Operations (CNO). (2006b). Task force individual augmentation (TFIA) update (NAVADMIN 273/06). Washington, DC: Bureau of Naval Personnel (BUPERS). Retrieved November 11, 2007, from http://www.npc .navy.mil/ReferenceLibrary/Messages/.

Chief of Naval Operations (CNO). (2007a). Administration of the navy-wide advancement examination for sailors in Iraq, Afghanistan, and the Horn of Africa (NAVADMIN 139/07). Retrieved November 12, 2007, from http://www.npc.navy.mil/ReferenceLibrary/Messages/.

Chief of Naval Operations (CNO). (2007b). Navy individual augmentee combat skills training (NIACT) (NAVADMIN 355/07). Retrieved November 12, 2007, from http://www.npc.navy.mil/ ReferenceLibrary/Messages/.

Chief of Naval Operations (CNO). (2007c). Task force individual augmentation (TFIA) update (NAVADMIN 136/07). Washington, DC: Bureau of Naval Personnel (BUPERS). Retrieved November 11, 2007, from http://www.npc .navy.mil/ReferenceLibrary/Messages/.

Chief of Naval Operations. (2007, September). Navy officer billet classification (NOBC) Codes (Vol. I). In *Manual of Navy officer manpower and personnel classifications* (NAVPERS 15839I) (Part C). Retrieved February 20, 2008, from https://buperscd.technology.navy.mil/bup_updt/508/OfficerClassification/ i/PT_C.htm.

Cobb, S. (1976, September-October). Social support as a moderator of life stress. *Psychosomatic Medicine, 38*(5), 300-314.

D'Mello, T, Williams IV, E., Eaton, M., & Pflanz, S.E. (2007, February/March). Stressors prior to and methods of suicide, US Air Force, 2000-2005. *Medical Surveillance Monthly Report ,13*(2), 8-9.

Department of Defense. (2006, August 11). *Deployment health* (DoD Instruction 6490.03). Washington, DC: Under Secretary of Defense for Personnel and Readiness. Retrieved February 11, 2008, from http://www.dtic.mil/whs/directives/corres/pdf/649003p.pdf.

Department of Defense. (1997, August 7). *Implementation and application of joint medical surveillance for deployments* (DoD Instruction 6490.3). Washington, DC: Under Secretary of Defense for Personnel and readiness. Retrieved February 11, 2008, from http://deploymentlink.osd.mil/pdfs/instruction_6490_3.pdf.

Eaton, K.M., Messer, S.C., Garvey-Wilson, A.L., & Hoge, C.W. (2006, April). Strengthening the validity of population-based suicide rate comparisons: An illustration using US military and civilian data. *Suicide and Life-Threatening Behavior, 36*(2), 182-195.

Erbes, C., Westermeyer, J., Engdahl, B., & Johnsen, E. (2007, April). Post-traumatic stress disorder and service utilization in a sample of service members from Iraq and Afghanistan. *Military Medicine, 172*(4), 359-363.

Expeditionary Combat Readiness Center (ECRC). (2007a) *Frequently asked questions.* Retrieved October 11, 2007, from http:// www.ecrc.navy.mil/content/FAQs.htm.

Expeditionary Combat Readiness Center (ECRC). (2007b) *What is an IA?* Retrieved November 8, 2007, from http:// www.ecrc.navy.mil.

Faram, M.D. (2008, January 21). Making IA happy. *Navy Times.*

Gal, R., & Jones, F.D. (1995). A psychological model of combat stress. In Zajtchuk, R. & Bellamy, R.F. (Eds.), *War Psychiatry* (pp. 133-148). Falls Church, VA: Office of the Surgeon General, U.S. Army.

Gifford, R.K., Ursano, R.J., Stuart, J.A., & Engel, C.C. (2006, March). Stress and stressors of the early phases of the Persian Gulf War. *Philosophical Transactions of the Royal Society B,* 361, 585-591. Retrieved November 15, 2007, from http:// www.pubmedcentral.nih.gov/picrender.fcgi?artid=1569630&blobtype=pdf.

Grieger, T.A., Kolkow, T.T., Spira, J.L., & Morse, J.S. (2007, May). Post-traumatic stress disorder and depression in health care providers returning from deployment to Iraq and Afghanistan. *Military Medicine, 172*(5), 451-455.

Griffith, J. (2007, October). Further considerations concerning the cohesion-performance relation in military settings. *Armed Forces & Society,* 34(1), 138-147.

Griffith, J., & Vaitkus, M. (1999). Relating cohesion to stress, strain, disintegration, and performance: An organizing framework. *Military Psychology, 11*(1), 27-55.

Halverson, R.R., Bliese, P.D., Moore, R.E., & Castro, C.A. (1995). *Psychological well-being and physical health symptoms of soldiers deployed for Operation Uphold Democracy: A summary of human dimensions research in Haiti.* Washington DC: Walter Reed Army Institute of Research.

Hoge, C. W., Auchterlonie, J.L., & Milliken, C.C. (2006, March 1). Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *Journal of the American Medical Association, 295*(9), 1023-1032.

Hoge, C.W., Castro, C.A., Messer, S.C., McGurk, D., Cotting, D.I., & Koffman, R.L. (2004, July 1). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care." *The New England Journal of Medicine, 351*(1), 13-22.

Hoge, C.W., Wright, K., Bliese, P., Adler, A., Thomas, J., Castro, C.A., & Milliken, C.C. (2004, April 19-21). *Prevalence and screening of mental health problems among combat soldiers pre- and post-deployment.* Paper presented at the RTO HFM Symposium, Budapest, Hungary.

Hollander, I.E., Bell, N.S., Phillips, M., Amoroso, P.J., & MacFarling, L. (2006). *A descriptive study of US Army soldiers referred to, evaluated by and enrolled in the army substance abuse program, 1988-2003.* Natick, MA: Military Performance Division US Army Research Institute of Environmental Medicine. Retrieved November 20, 2007, from http://stinet.dtc.mil/cgi-bin/GetTRDoc?ADA456792&Location=U2&doc= GetTRDoc.pdf.

Hosek, J., Kavanaugh, J., & Miller, L. (2006). *How deployments affect service members.* Santa Monica, CA: RAND.

Hourani, L.L., Warrack, G., & Coben, P.A. (1999, Winter). A demographic analysis of suicide among US Navy personnel. *Suicide and Life-Threatening Behavior, 29*(4), 365-375.

Hoyt, G.B. (2006). Integrated mental health within operational units: Opportunities and challenges. *Military Psychology, 18*(4), 309-320.

Ingraham, L.H., & Manning, F.J. (1981, June). Cohesion who needs it, what is it? *Military Review* 61(6), 2- 12.

Iowa Persian Gulf Study Group. (1997, January).Self-reported illness and health status among Gulf War veterans. *Journal of the American Medical Association 277*(3), 238-245.

Johns, J.H., Bickel, M.D., Blades, A.C., Creel, J.B., Gatling, W.S., & Hinkle, J.M. (1984). *Cohesion in the US military.* Washington, DC: National Defense University Press.

Johnson, S.J., Sherman, M.D., Hoffman, J.S., James, L.C., Johnson, P.L., & Lochman, J.E. (2007, February). *The psychological needs of US military service members and their families: A preliminary report.* American Psychological Association. Retrieved November 14, 2007, from http:// www.apa.org/releases/deployment.html.

Jontz, S. (2006, April 3). Sailors learn army basics to prep for downrange deployment. *Stars and Stripes*, Mideast edition. Retrieved September 27, 2007, from http://stripes.com/article.asp?section=104&article=35338&archive=true.

Milliken, C.C., Auchterlonie, J.L., & Hoge, C.W. (2007, November 14). Longitudinal assessment of mental health problems among active and reserve component soldiers returning from the Iraq War. *Journal of the American Medical Association 298* (18), 2141-2148.

Murray, M.A. (2007, February 22). *Post traumatic stress disorders: The facts.* US Army War College. Retrieved November 25, 2007, from http:// stinet.dtic.mil/cgi-bin/GetTRDoc?AD =A467315 &Location=u2&doc=TRDoc.pdf.

Navy Environmental Health Center. (2000, September). Implementing guidance for deployment health surveillance (NEHC TM 6490.00-1). Navy and Marine Corps Public Health Center. Retrieved January 10, 2008, from http://www-nehc.med.navy.mil/CDRomtoc.htm.

Navy Knowledge OnLine (NKO). (2007a). *IA command handbook.* Naval Education and Training Command. Retrieved October 24, 2007, from https://wwwa.nko.navy.mil/portal/page?paf_pageId=page1& requested=141717.

Navy Knowledge OnLine (NKO). (2007b). *IA sailor handbook.* Naval Education and Training Command. Retrieved October 24, 2007, from https://wwwa.nko.navy.mil/portal/page?paf_pageId=page1& _requested= 41717.

Newby, J.H., McCarroll, J.E., Ursano, R.J., Fan, Z., Shigemura, J., & Tucker-Harris, Y. (2005, October). Positive and negative consequences of a military deployment. *Military Medicine, 170*(10), 815-819.

Office of the Surgeon Multinational Force-Iraq and Office of the Surgeon General United States Army Medical Command. (2006, November 17). *Mental Health Advisory team IV (MHAT IV) Operation Iraqi Freedom 05 -07 Final Report.* Retrieved November 25, 2007, from http://www.armymedicine.army.mil/ news/mhat/mhat_iv/MHAT_IV_Report_17NOV06.pdf.

Office of the Under Secretary of Defense (Comptroller). (2006, February). Military pay policy and procedure active duty and reserve pay. In *Financial Management Regulation* (DoD 7000.14-R) (Volume 7A, Chapter 10). Retrieved February 20, 2008, from http://www.defenselink.mil/comptroller/fmf/.

Oliver, L.W., Harman, J., Hoover, E., Hayes, S.M., & Pandhi, N.A. (1999). A quantitative integration of the military cohesion literature. *Military Psychology, 11*(1), 57-83.

Orcutt, H.K., Erickson, D.J., & Wolfe, J. (2004, June). The course of PTSD symptoms among Gulf War veterans: A growth mixture modeling approach. *Journal of Traumatic Stress, 17*(3), 195-202.

Pincus, S.H., House, R., Christenson, J., & Adler, L.E. (2001, April-June). The emotional cycle of deployment: A military family perspective. *US Army Medical Department Journal. Retrieved November 15, 2007, from* http://www.hoah4health.com/ deployment//familymatters/emotionalcycle.htm.

Pincus, S.H., & Nam, T.S. (1999, January-March). Psychological aspects of deployment: The Bosnian experience. *Army Medical Department Journal,* 38-44. Retrieved November 15, 2007, from http://das.cs.amedd.army.mil/PDF/J991.pdf.

Post-Deployment Health. (2007a) *DD form 2795 primer*. Department of Defense Deployment Health Clinical Center. Retrieved October 20, 2007, from http://www.pdhealth.mil/guidelines/downloads/ DD_Form2795_Primer.pdf.

Post-Deployment Health. (2007b). *Guidelines for post-deployment health screening utilizing the DD Form 2796*. Department of Defense Deployment Health Clinical Center. Retrieved October 20, 2007, from http://www.pdhealth.mil/guidelines/downloads/DD_Form2795_Primer.pdf.

Riddle, J.R., Smith, T.C., Smith, B., Corbeil, T.E., Engel, C.C., & Wells, T.S. (2007, February). Millennium cohort: The 2001-2003 baseline prevalence of mental disorders in the US military. *Journal of Clinical Epidemiology, 60*(2), 192-201.

Robinson, S.L. (2004, September). *Hidden toll of the war in Iraq: Mental health and the military.* Washington, DC: Center for American Progress.

Scoville, S.L., Gubata, M.E., Potter, R.N., White, M.J., & Pearse, L.A. (2007, October). Deaths attributed to suicide among enlisted US armed forces recruits, 1980-2004. *Military Medicine, 172*(10), 1024-1031.

Siebold, G.L. (1999). The evolution of the measurement of cohesion. *Military Psychology*, *11*(1), 5-26.

United States Navy. (2007). *Chief of Naval Operations quotes*. Retrieved October 19, 2007, from http://www.navy.mil/ navydata/leadership/quotes.asp?q=11&c=3.

Vasterling, J.J., Proctor, S.P., Amoroso, P., Kane, R., Gackstetter, G., & Ryan, M.A.K. (2006, March). The neurocognition deployment health study: A prospective cohort study of army soldiers. *Military Medicine, 171*(3), 253-260.

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